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Jump on the innovator's train: cognitive principles for creating appreciation in innovative product designs

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Abstract In everyday life, we find shared preferences for idiosyncratic product features paradigmatically displayed by bestselling gadgets like Apples iPhone's touch screen, which after gaining acceptance and appreciation are susceptible to being copied by competitors. Psychological research on the phenomenon of shared preferences for innovative design features and the probable benefit of copying them is still lacking. We tested gains of acceptance for imitators through an adaptation paradigm where typicality and liking of potentially innovative features were analysed dynamically. We found significant changes in typicality and liking for imitators being highly similar to the original. These adaptation processes in combination with transfer effects create the specific opportunity for imitators to jump on the innovator's train by providing similar innovative features and thereby participating in the initial innovator's success. Importantly, they participate best not by solely copying a specific novel feature, but by additionally generally looking very similar to the innovator.

Keywords Aesthetic appreciation · Prototypicality · Dynamics · Adaptation · After effects · Transfer · Liking · Imitation · Copycats · Innovation

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1 Introduction

In real-world contexts, we find high amounts of shared taste for specific features of consumer products such as touch screen mobile phones. Brands introducing such innovative design features into the market (e.g. Apple via the iPhone or the iPad) often inherit clear market dominance in their application areas at first (Rawsthorn 2006); however, successful innovative features are susceptible to being copied by competitors. Thus, successful features of consumer products are a major target of companies creating so-called copycats, who benefit from copying the general outer appearance of successful products or specific features in particular (Loken et al. 1986; Warlop and Alba 2004).

Systematic research investigating the basis or the genesis of such phenomena of common-sense appreciation for specific innovative features is rare, although the effects of taste and appreciation on the markets are of major relevance making it a fundamentally important issue of psychological research. Also, it is as yet rarely discussed which cognitive mechanisms underlie the process of getting a successful innovative design feature, and what kind of lookalike a copycat needs to be to maximally benefit from copying. In this study, we experimentally simulated the familiarization and elaboration of novel, potentially innovative features of a product, to investigate the process of getting accepted through adaptation processes. By assessing the perceived typicality and liking of this potentially innovative product, as well as of products with a more or less strong similarity to the "innovator", we thereby observed how shared preferences for specific features develop through adaptation and transfer effects, cognitive principles, which potentially result in a modified object evaluation.

One major factor for generating a shared basis for aesthetic appreciation is adaptation towards frequently presented design properties inducing so-called cycles of preferences, synchronized preferences for similar outward appearances of products (Carbon 2010). In 2001, BMW presented the highly innovative 7-series (E65) with a unique design element (Kreuzbauer and Malter 2005), the mockingly termed "*Bangle Butt*" (named after the former chief-designer Chris Bangle), leading to controversial discussion and consumer rejection. Importantly, from a theoretical point of aesthetic research, the *Bangle Butt* was not only accepted after a while underlining the importance of familiarization (Zajonc 1968) and elaboration (Carbon and Leder 2005), but has even been imitated by competitors such as Mercedes-Benz S-Class (W221) and Lexus LS-series (USF-40).

How do such "adaptation processes" affect the perception of products with specific innovative features? When a new category (e.g. chairs or cars) or subcategory (e.g. office chairs or sports cars) is learned, a variety of examples is perceived, their characteristics are extracted and a norm or prototype is formed—these perceptions are strongly dependent on the individual learning history, for instance induced by cultural, social and Zeitgeist factors (Carbon 2010). Only after such a learning process has taken place is it possible to judge the typicality of a perceived example by comparing it to the norm or prototype. The consumer product market in Western societies is typically characterized by strong dynamics with new innovations are made and introduced on the market very fast, while others vanish or become design classics. As new design innovations are often rejected at first sight when introduced to the market (Faerber et al. 2010; Moulson and Sproles 2000), because they potentially disrupt the consumers' "visual habits"(Carbon and Leder 2005), it is necessary to let the beholders familiarize themselves with the products. This is usually done via advertisement or marketing strategies in which the norm or prototype probably becomes recalibrated or adapted, and which is emphasized experimentally in adaptation paradigms (see Carbon 2011; Faerber and Carbon 2012). After this recalibration, new innovations are better integrated into the perceptual system, thus into their category, leading to easier processing. As the perceptual system is no longer overstrained, the perceiver in turn likes the now-established new objects much more. Products imitating successful innovative features such as BMW's *Bangle Butt* probably benefit from imitating via transfer effects, because they literally jump on the "innovator's train" when the ride (i.e. the familiarization and adaptation process) has already began which brings them into the favourable position of (a) benefiting from the innovation as such but also (b) using the initial time taken by consumers to become familiarized with the innovation to prevent consumer rejection. These combined factors lead to potentially higher degrees of acceptance and liking of design innovations. Adaptation and familiarization, thus, seem to be main cognitive processes underlying the appreciation of innovative product designs and are accompanied by transfer effects, which could lead to the appreciation of imitating products.

Although adaptation effects were demonstrated within experimental settings repeatedly for typicality or changes to the norm (e.g. Carbon and Ditye 2011; Rhodes et al. 2009), but rarely for liking or attractiveness (effects for faces see Rhodes et al. 2003), it is yet unclear whether within such processes transfer effects can lead to the success of a benefitting product (imitator) that imitates an innovative or specific successful feature. Transfer effects as such have been rarely researched so far, most evidences originate from adapting towards specific facial stimuli (Barrett and O'Toole 2009; Carbon and Ditye 2012; Chen et al. 2010). Particularly interesting for design research is whether a product has to be a real lookalike of the innovator or just needs to copy the specific successful innovative feature, e.g., the *Bangle Butt*, to be likewise successful in the market. Here, we analyze the impact of similarity of such copies to the adaptor, which has not been researched before. Within the perceptual process of evaluation imitators would probably especially benefit from the innovators' success, if they not only copied that innovative feature, but additionally were very similar to the innovator, thus being a very good lookalike. The acceptance and appreciation could probably be transferred more easily due to a higher similarity, because regarding distributed models discussing the effect of priming, which refers to the facilitation of the perception of a stimulus due to a pre-activation of a pre-stimulus perception, implies that similar objects share the neural networks necessary to perceive these stimuli (e.g. Faerber et al. 2010; Hutchison 2003). The amount of the shared neural networks could probably moderate the transfer effects, which lead to higher typicality and liking ratings for imitators.

To pursue this hypothesis, we created an experimental analogy by generating computer-aided designs of chairs, which differed in the degree of overlap between the "adaptor chair" (analogous to the innovative product, here the BMW) and "imitating chairs" (analogous to the imitating products, here the Mercedes/Lexus) to reveal transfer effects of appreciation from the "adaptor" to the "imitators." Thereby the adaptor chair inherited highly distinctive design features of an elongated chair back (feature 1), which is potentially also a highly innovative design feature due to its uniqueness. Furthermore, a second feature dimension was employed as analogous to a fashion trend by assigning low colour saturation to the chair (feature 2). To simulate adaptation and transfer effects from the appreciation of one to another product design, we investigated the change of typicality to gain information on a potential recalibration process of the norm or prototype, and we investigated liking to assess whether the aesthetic appreciation had changed. It is indeed often assumed that typicality and liking are correlated, and as mentioned afore hand that an increase in familiarity leads to an increase in typicality as well as in liking. Whereas Hekkert et al. (2003)

suggested novelty as well as typicality being moderators of liking, Blijlevens et al. (2012) proposed a curvilinear relation between typicality and liking. As typicality ratings seem to be more directly linked to comparing exemplars with the norm, they should, on the one hand, also be more directly and stronger affected. Liking ratings, on the other hand, are not solely influenced by changes in typicality, but are furthermore influenced by the general aesthetic preferences of the participants. Regarding the transfer effects, we expected the strongest effects for the adaptor chair (smallest/or even *no* transfer condition) and the least strong effects for the least similar imitating chair (largest transfer condition).

2 Method

2.1 Participants

Forty undergraduate students (33 women; $M = 21.6$ years, SD = 3.5; normal vision and colour abilities) participated for course credit. All participants were non-experts regarding design chairs, which was assured by a post-experimental questionnaire.[1]

2.2 Stimuli

All stimuli used in the experiment were a subset of four large sets consisting of different photo-realistic 3Dchairmodels (Evermotion) varying on 10 (*proportion* = elongation of chair back; 1 = original, 10 = most elongated) × 10 levels (*colour saturation* of red; 1 = most saturated, 10 = least saturated) (Fig. 1). For the test set, we employed 3 × 3 levels of proportion x colour saturation (both times: levels 1, 3, 5) including the adaptor chair and 3 “imitating chairs” (imitator 1–3). By conducting a pre-study, we assured increasing differences of outward appearance from imitator 1–3 compared to the adaptor chair (see section pre-study concerning the similarity of the chairs). For the adaptation set, we used 2 × 2 levels of proportion and colour saturation (levels 9, 10), represented by four variants of the adaptor chair with different hues.

2.3 Procedure

To test sustained adaptation effects (Carbon and Ditye 2011; Rhodes et al. 2009), we decided to divide the experiment into two sessions with a delay of at least 2 days. In the first session, we conducted a pre-adaptation evaluation (test phase 1, T1) followed by a first adaptation phase, while the second session started with a shorter second adaptation phase followed by a post-adaptation evaluation (test phase 2, T2). In both identical evaluation phases, we first assessed the variable liking and then typicality through relative judgements similar to Buckingham et al. (2006) by showing two stimuli of the test set (same chair model) simultaneously and asked the participants which of the two chairs they liked more or found more typical. In a self-paced rating procedure, participants indicated on a 5-point Likert scale how much more they liked the chosen chair (or to what extent they found it more typical) than the other model displayed (the higher the value, the stronger the difference, from 1 = “little” to 5 = “very much”).

To let the participants familiarize with and elaborate the stimuli, we used in both adaptation phases the repeated evaluation technique (RET; Carbon and Leder 2005; Carbon et al. 2008; Gerger et al. 2011), in which individually tested participants rated the randomized stimuli on different attributes (24 and 12, respectively)[2] such as elegant or functional on a 7-point Likert scale (1 = “very little”, 7 = “very much”).

2.4 Pre-study concerning the similarity of the chairs

In the pre-study ($N = 8$), participants rated pair wise the overall similarity between the chairs on a 7-point Likert scale (1 = “very dissimilar”, 7 = “very similar”). The similarity of the chairs between chair 0 and 1 was $M = 4.38$ (SD = 1.9), chair 0 and 2: $M = 3.00$ (SD = 1.3), and chair 0 and 3: $M = 1.75$ (SD = 1.1). An univariate analysis of variance with the assumed similarity of the chairs as within-subject factor and the similarity ratings as dependent variable resulted in a large effect of distance for similarity of the chair, $F(2,14) = 11.8$, $p < .01$, $\eta_p^2 = 0.63$. Post hoc analyses of the similarity of the chairs confirmed

[1] None of the participants could assign the name, designer or brand name of the following models: Rocking Armchair “Rod” of Charles and Ray Eames, “Wassily No. B3” of Marcel Breuer, “DSW” of Charles and Ray Eames, “Aluminium Chair EA 105” of Charles and Ray Eames, “LC4” of Le Corbusier,“Chair Cesca B64” of Marcel Breuer, “Lounge Chair and Ottoman” of Charles and Ray Eames,“LC2” of Le Corbusier,“Joe” of Gionatan De Pas, Donatod’ Urbino and Paolo Lomazzi, “Hill House Chair” of Charles Rennie Mackintosh, “Panton Chair” of Verner Panton, “La Chaise” of Charles and Ray Eames, “Marshmallow Sofa” of George Nelson, “Barcelona chair No. MR90” of Mies van der Rohe, “Armchair No. MR20” of Mies van der Rohe, “Wiggle Side Chair” of Frank Gehry, “Rood blauwestoel” of Gerrit Rietveld, “Stuhl No. 14” of Michael Thonet, “W. W. Stool” of Philippe Starck,and “Tulip Chair” of Eero Saarinen.

[2] Participants rated the adaptation stimuli on the following 24 attributes in the first adaptation phase: appealing (ansprechend), carefully thought out (durchdacht), classic (klassisch), compact (kompakt), conventional (konventionell), durable (beständig), elegant (elegant), extravagant (extravagant), formal (förmlich), functional (funktionell), futuristic (futuristisch), inviting (einladend), neat (ordentlich), of high quality (hochwertig), embellished/playful (verspielt), overwhelming (erdrückend), pleasant (angenehm), dull (eintönig), regular (regelmäßig), restrained (dezent), rounded (abgerundet), solid (gediegen), tasteful (geschmackvoll) and stuffy (bieder). The second adaptation phase comprised the following 12 attributes: bulky (sperrig), clear (klar), comfortable (komfortabel), conservative (konservativ), well considered (überlegt), practicable (praktisch), luxurious (luxuriös), minimalist (schlicht), modern (modern), robust (robust), stylish (stilvoll) and inventive (phantasievoll).

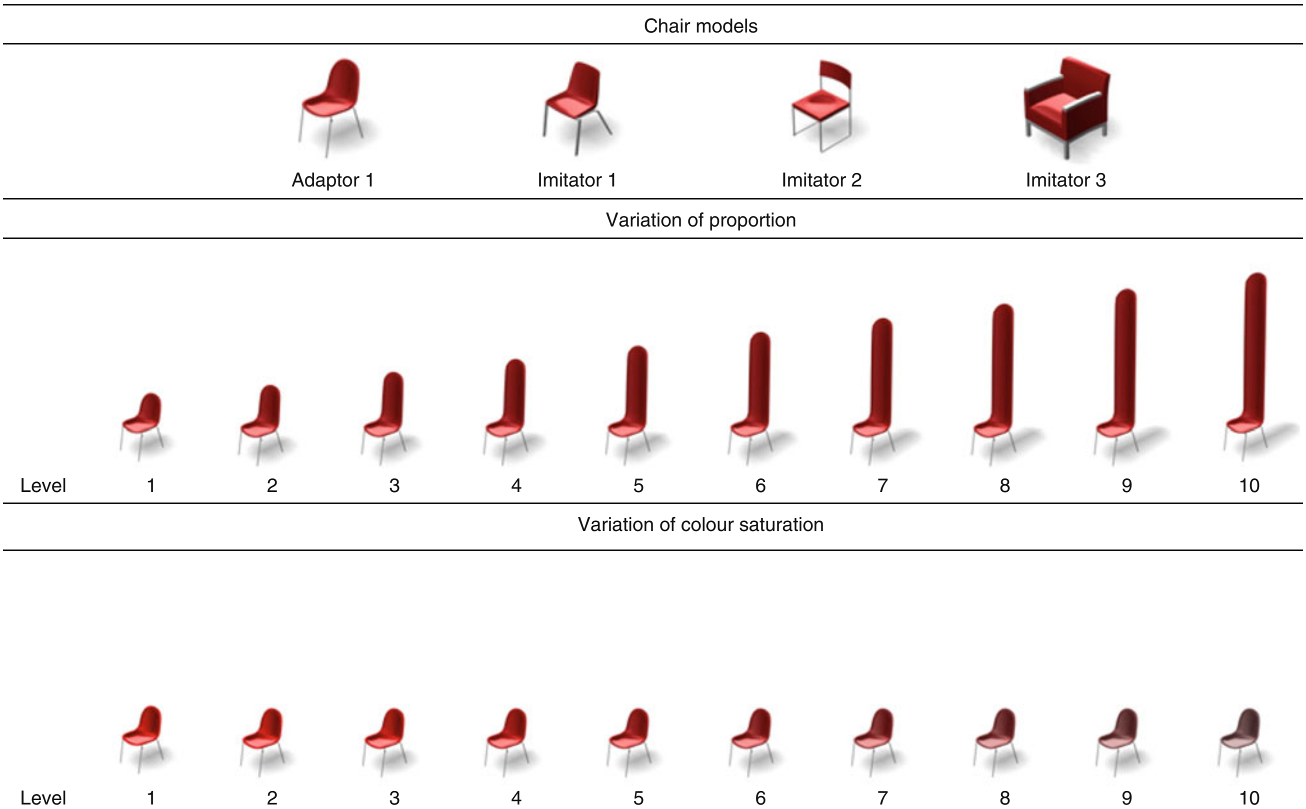

Fig. 1 3D chair models and their variation in the features proportion and *colour* saturation. Each of the four chair models was systematically varied on ten levels of proportion and *colour* saturation. The levels of proportion relate to extending the length of the chair back via 3ds Max, the ones of *colour* saturation to changes in saturation via Adobe Photoshop

chair 0 and 1 being most similar and chair 0 and 3 being least similar.

3 Results

Our main research purpose in this study concerned the simulation of adaptation and transfer effects of appreciation from highly distinctive designs to more or less similar imitators, who imitate highly distinctive and potentially innovative features of the innovator. We operationalized this aim by measuring the changes of typicality and liking for the adaptor as well as the different versions of the three imitators after having intensively elaborated on the adaptor (innovator) with the most extreme versions of the observed features. To investigate this question, we analysed the ratings for each imitator as well as for the adaptor itself on a stimulus basis to observe changes due to adaptation and transfer.

We started with recalibrating the raw values of the relative judgements for typicality and liking to a range of −4.5 to 4.5 to receive a scale of equidistant and continuous levels. For instance, when a participant rated a stimulus with "5" as more typical, then this stimulus was assigned 4.5 points and the paired stimulus −4.5 points for this rating. For further processing the data, we averaged the recalibrated data across the different ratings for each stimulus and analysed the data on a stimulus-based level. As we were interested in stimulus-based changes (in liking and typicality) between T1 and T2, we subsequently conducted paired *t* tests on the test phases (T2 vs. T1) for each stimulus of each chair and for both dependent variables. Results showed significant adaptation effects for typicality as well as liking with increases for those stimuli, which were most similar to the adaptors (more extreme versions of the features), whereas the ones dissimilar to the adaptors decreased (less extreme versions of the features) (Fig. 2). The typicality for eight out of nine stimuli changed significantly for the adaptor chair as well as for imitator 1, while we obtained only seven significances for imitator 2 and only five for imitator 3. We observed far less pronounced adaptation effects for liking than for typicality, with only three significant changes observed for the adaptor chair, two for imitator 1 and only one for imitator 3. For both variables, we found a tendency for adaptation effects to be stronger for those imitators which were more similar to the innovator, thus being better lookalikes.

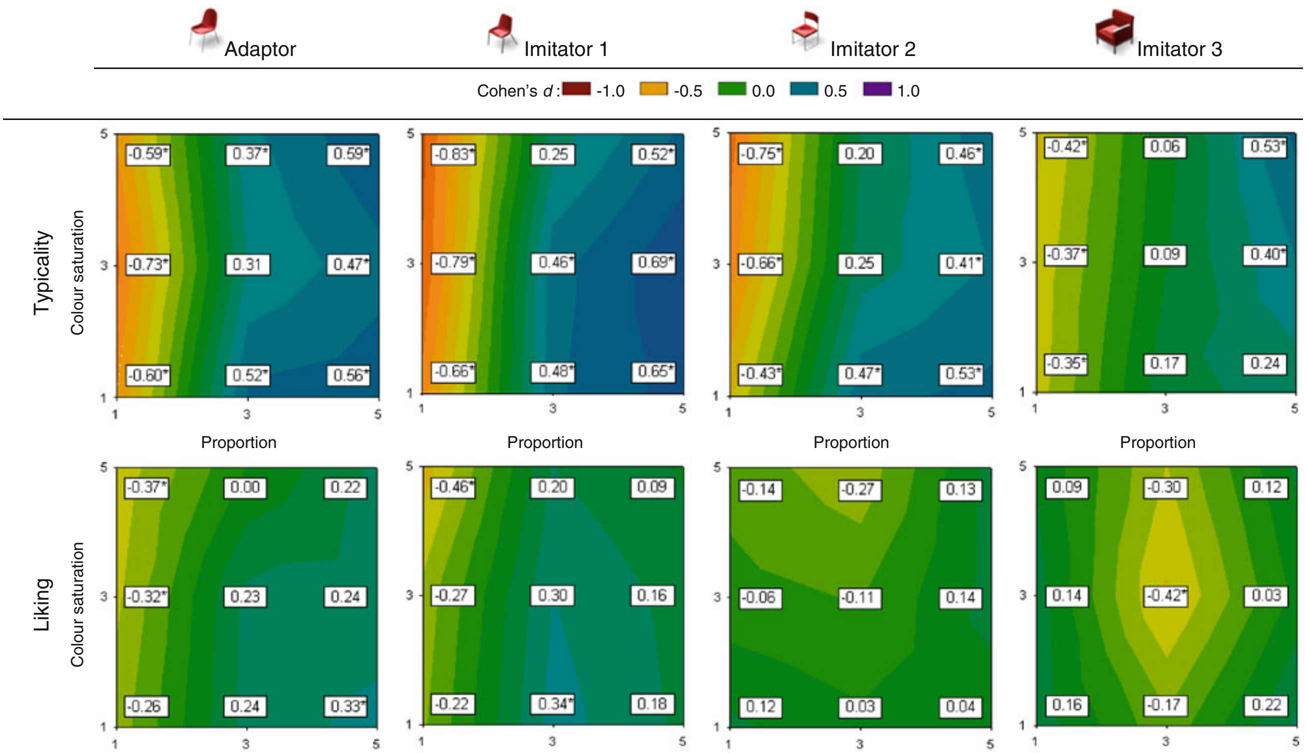

Fig. 2 Adaptation and transfer effects of product appreciation. This figure shows the implemented bi-dimensionally manipulated test set including the levels 1, 3 and 5 for both features (proportion and *colour* saturation) for all chairs. Effect sizes of changes over time for typicality and liking are indicated by Cohen's *d*o f the regarding *t* tests on the test phases (T2 vs.T1). Significances of $p < .05$ of the *t* tests are indicated with *asterisks*

4 Discussion

Although providing innovative products is key to gaining market success (Leder and Carbon 2005), engineering innovations also requires enormous innovative power and costs, among others on the basis of redesigning and restyling processes (Howard et al. 2010; Mengoni and Germani 2009). Beside the often praised potency of innovations being the main drivers for long-lasting revenues, they also regularly inherit the risk of becoming a flop. This is one important reason why copycats exist—products which "jump on the (successful) innovator's train" to imitate or copy the properties of this target. Within the present study, we simulated the common cognitive process of familiarization with highly distinctive features by implementing an adaptation paradigm, and investigated whether these features (elongated chair back and low colour saturation) were accepted by participants through assessing typicality and liking. In doing so, we questioned whether adaptation and its transfer would affect the perception of the innovator and the imitators, who varied in their similarity to the innovator.

We found clear adaptation effects for typicality, which indicates that adaptation processes occurred and probably the norm or prototype had been recalibrated. These adaptation effects transferred to the imitators dependent on their similarity to the adaptor chair. Thus, after familiarization with extreme versions of highly distinctive features (proportion and colour saturation), these features get integrated into our visual habits and less extreme versions of these features, as shown in the test phases, become more typical over time. Importantly, the decreasing strength of transfer effects indicate that people do not solely adapt to the specific (extreme) feature of the adaptor, but also to the general characteristic of the adaptor and/or its relation(s) to the specific feature. This process is comparable with processes in the fashion industry where designers show extreme versions of innovative products on the Haute Couture shows, which are on display as less extreme versions on Prêt-à-porter shows later on. Shortly afterwards, slightly adapted versions of these less extreme products are produced by other companies. The extreme versions of the fashion trends shown in the haute couture shows are analogous to the extreme versions of the chairs in the present adaptation study. These extreme versions work like an anchor which is thrown out and which drags the ship towards this anchor. After the anchor is dropped, less extreme versions of specific fashion trends are presented, advertised and introduced to the market—a little bit later copied versions of the originals appear.

We observed far less strong adaptation effects for liking than for typicality with only small transfer effects; the effects were further modulated by the similarity of the imitators to the adaptor with qualitatively similar patterns of change. Less strong adaptation effects for liking than typicality ratings can be explained by a variety of factors. Firstly, liking could be more resistant to changes due to adaptation as liking probably needs stronger adaptation processes and/or more time to adapt. This would lead to different time courses of change for typicality and liking. Secondly, liking is possibly much less dependent on the norm or prototype than typicality, because aesthetic preferences are far less influenced by changes in the norm or prototype regarding adaptation. For instance, intense elaboration during the adaptation process could have generated high levels of familiarity but is also accompanied by high chances of boredom followed by less liking (Bornstein et al. 1990; Faerber and Carbon 2012). Additionally, as empirically revealed by Hekkert et al. (2003), liking is moderated along with familiarity by perceived novelty. Thus, while the typicality for distinctive features might have increased due to adaptation, novelty also decreased and as both variables influence liking, this could have led to weaker effects in liking. This line of arguments is also supported by recent findings suggesting a curvilinear relation between typicality and liking with medium levels of typicality being preferred most (Blijlevens et al. 2012). Thus, design features which become too typical will be devaluated over time. Last but not least liking can be considered as a specific processing mechanism, which in contrast to associated processes such as assessing the typicality, is specifically more complex and super sensitive to subtle changes of design features (Faerber and Carbon 2012). In sum, differences in the dynamics of typicality and liking could, on the one hand, be caused by different time courses of these variables and/or because liking is a more complex and more sensitive process, which is influenced by a variety of different moderating cognitive and emotional processes.

We found the strongest transfer effects for those imitators which not only copied the highly distinctive features, but which also looked very much like the innovator (had the highest similarity). Thus, regarding the example of BMW's *Bangle Butt*, this indicates that a Mercedes-Benz (being very similar to a BMW in terms of size, concept and prestige) would probably benefit more from copying a highly distinctive feature than a Ferrari, which typically shows much lower similarity to a BMW. In some cases, however, products with moderate similarities benefit more than strong lookalikes. For example, van Horen and Pieters (2012) found that it is highly dependent on situational effects whether a product gains success. When participants were asked to imagine the original and compare a product imitating its design properties, moderate similar products were preferred to highly similar products in comparison with the original. However, when participants were asked to rate their general impressions of imitating products, they preferred those products highly similar to the original. Further variables modulating similarity effects are discussed in the literature, among them the expertise level of the rater (see Jakesch et al. 2011). In the case of followers of BMW's *Bangle Butt* with low car expertise an adaptation process towards this feature could lead to liking of this feature not only in BMWs specifically, but to liking of all cars copying this feature, since naïve raters would hardly be able to distinguish between the different brands such as BMW, Mercedes-Benz or Lexus.

In sum, the pronounced effects on changes of typicality indicate that the mere exposure to new, highly distinctive and/or unfamiliar design properties increases the typicality of such properties, making them more familiar and common, and thus enabling integration into the observer's visual habits (Carbon and Leder 2005; Faerber et al. 2010). Such a familiarization, which is likely to lead to higher liking (cf. Bornstein 1989), seems to be the essential precondition of accepting and truly appreciating new and innovative design (Hekkert et al. 2003). The present study demonstrated the power of (transfer) adaptation effects on increasing appreciation of highly distinctive and thus potentially innovative product designs. Most importantly, the present study also opens the possibility of simulating dynamic processes of appreciation by systematically analysing adaptation mechanisms in the realm of a highly controlled experimental study, which can be used as a tool for reducing the risk of placing highly innovative products on the market. Although in the realm of such highly controlled experimental settings, the manipulation and variations of the stimulus classes are limited, and thus can never reproduce the reality, they nevertheless present a great opportunity to simulate effects and resolve the causal relationships between the variables of interest.

Within this study we observed and discussed cognitive principles to more deeply understand changes in the perception of design objects, particularly of innovative products and their copycats. We focused on the interplay of familiarization, adaptation, and transfer effects on typicality and liking assessments to get insights into typical familiarization effects which can be observed in real consumer world with innovative products and imitators trying to copy specific design features of the innovators.

The moral of the study: the true "innovators" (Rogers 2003) providing innovative, and consequently distinctive, design features have indeed one major advantage: they have the first such models on the markets equipping them with potential (successful) market leadership. Unfortunately, it can be demonstrated that humans lacking a visual familiarity towards innovative designs also dislike them

(Faerber et al. 2010; Leder and Carbon 2005), because they need time and, most importantly, elaboration to appreciate them (Carbon and Schoormans 2012). Ironically, imitators benefit from this delay, especially if they capture the unique design elements of innovators, thus being very good lookalikes, while decreasing their own idiosyncrasy.

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