Being funny: A selectionist account of humor production

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Abstract

In this paper, we develop a theory to explain why some people possess a good sense of humor (i.e., are funny) while others do not. In essence, the theory follows the general selectionist (Donahoe and Palmer 1994) scheme of response generation *and* selection*: People who both generate a lot of jokes and are sensitive to negative appraisal will be considered to be humorous by their peers. Data to test this theory are described and analyzed. Most results are in accord with our theory and alternative explanations are ruled out.*

In recent years, quite some attention has been devoted to humor production and perception. An inspection of recent research on humor reveals that there are at least two types of approaches to the topic. The first type of approach attempts to uncover the essence of humor. The central question is: What is funny and why it is funny? (e.g., Attardo and Raskin 1991; Binsted and Ritchie 1997; Hallett and Derks 1998; Veatch 1998). A consensus seems to have been reached that humor boils down to a form of *incongruity*, in the sense that two or more elements are combined that usually do not belong together. This idea dates back at least to Skinner (1957) and Kant (1790). For example, Rothbart (1996) has shown that children in a pre-operational phase (in Piaget's sense) perceive water replacement from a high-but-thin can to a low-but-thick can as funny (presumably, they think some water is lost in the process, which is incongruent with previous water experience). On the other hand, children in the operational phase do not perceive the water replacement process as funny. The second type of approach investigates individual differences in humor appreciation. The central question is "Who reacts

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to jokes?'' and more specifically ''Who reacts to which type of jokes?'' (e.g., Herzog and Hager 1995; Ruch 1996; Veatch 1998).

In the present article, we want to combine both approaches and tackle the question ''Who is funny and who is not?'' Recently, Köhler and Ruch (1996) have touched upon this question. These authors investigated the relation between basic temperamental dimensions and the production of humor. They measured humorousness by means of indices of actual humor production and by means of self-ratings. They found weak but significant relations between Eysenck's extraversion and psychoticism on the one hand, and actual humor productivity on the other hand. However, Köhler and Ruch's (1996) approach focuses on the structural relations between traits. Therefore, it does not touch upon the processes leading to humorous behavior, which is at the core of the present research.

To present our ideas on the development of humorous behavior, we rely on the conceptual framework offered in Veatch's (1998) theory of humor. This author delineated three conditions for a behavior to be considered funny. First, the message must reveal that everything is OK. Second, some belief about how things ought to be must be violated in the message (compare with the pre-operational child's belief that water does not vanish, as in the example above). Third, both contents must be present in awareness simultaneously in such a way that the message that everything is OK dominates the violation of the belief about how things ought to be. This theory suggests that there are three classes of jokes. First, a behavior meant to be funny (i.e. a joke) can miss its target because it is too usual. Let's call these *class* 1 jokes (lame jokes). Second, a joke can be funny if the delicate balance is achieved. Let's call these (successful) jokes *class* 2 jokes. Third, a behavior meant to be funny can miss its target because it is too unusual. These (absurd or offending) jokes will be referred to as *class* 3 jokes. Thus, the job a would-be humorist faces appears quite delicate. In Veatch's words,

> If a speaker wants to have an audience laugh along with her, she must present a situation in a joke or other format which violates their norms and at the same time seems acceptable in some way to them. This is a tight-rope walk on the emotions (1998, p. 209).

How can an individual master this task? Theories of humor production usually provide a system of rules that can, in principle, be used to generate good jokes (class 2 jokes). It is unlikely, however, that a humorist has an explicit knowledge of these rules. Especially the theory of

Attardo and Raskin (1991), which proposed a hierarchical set of rules, is unlikely to be mastered explicitly by an average good joker. This ignorance is similar to a native speaker's ignorance of the grammar of her mother tongue, although she applies the rules correctly. Therefore, we think these theories provide a thorough description of what is funny and what is not rather than an explanation of how one learns to produce good humor. Moreover, even if some of these rules are explicitly held by humorists, they may be wrong. For example, Huber and Leder (1997) showed that cartoonists were wrong in believing that compact cartoons were funnier than non-compact ones. Apparently, we have a paradox here. Humor production seems so complex and delicate that it seems unlikely that humorists use the complex set of rules that have been discovered to underlie humor. How do they succeed to be funny?

A selectionist approach may offer a way out of this seeming paradox (Donahoe and Palmer 1994; Dewitte and Verguts 1999). The core of the selectionist philosophy is that complex behavior evolves in a way similar to the (Darwinist) way in which a species evolves. A lot of possibilities are tried out (generated) of which only the best survive. In the behavioral context, "surviving" means that an environment-behavior relation (EBR) is reinforced and allowed to be replicated later on. On the other hand, an EBR that is repeatedly punished or non-reinforced becomes extinct in the sense that it is not allowed to be emitted in a later phase. Small copying errors in EBRs (compare with gene copying errors) as well as coalitions of EBRs with one another (compare the coalition of male and female genes in zygote formation) produce a rich variety of EBRs. From this variety, the environment (e.g., friends at school) eliminates poor EBRs from the population of EBRs. If the generation-selection process continues long enough, a shaping process is the result, out of which more and more complex behaviors evolve gradually. Although much remains to be done, the neuronal foundations of this selection process are beginning to be discovered (e.g., Donahoe, Burgos and Palmer 1993; Wise and Bozarth 1987).

This theory sheds a new light on the humor production process. From the selectionist point of view, being funny boils down to 1) generating many jokes and 2) selection of the best ones. To be funny, it is necessary to make many jokes: In this way, some jokes will fall in Class 2 (as defined above). The environment may then select these from the joke population. Of course, the humorist should be sensitive to her social environment, otherwise the good jokes will not be selected and remain "alive" in similar

proportions to the Class 1 and 3 responses. In fact, if Class 1-2-3 responses are selected to a similar degree, then the person will not be considered funny, since Class 1 and 3 responses are occurring more often than Class 2 responses (Class 2 responses maintain the delicate usual-unusual balance and are therefore assumed to be less frequent). The importance of sensitivity is illustrated in a study by Derks and Berkowitz (1989). They showed that the reaction of the audience is not only a function of the funniness of the joker. For instance, no laughter may result in an aggressive reaction of the joker. Therefore, social cues may indeed be so subtle that sensitivity plays an important role in the development of good jokers. In sum, the requirements for a sense of humor can be rephrased as 1) generating many jokes and 2) sensitivity to the social environment.

More formally, suppose p_u denotes the proportion of ''unusual'' behaviors (i.e., all Class 1-2-3 jokes, the responses which are ''intended to be funny'') for a certain person, and p_u^+ denotes the proportion of funny responses (i.e., Class 2). Then the first assumption might be reformulated as follows: If p_u^+/p_u is high, then p_u is high. Note that this prediction runs counter to what is to be expected from a pure mathematical point of view since p_u is in the denominator of this fraction. However, Köhler and Ruch (1996) report a substantial relation (around .60) between quality and quantity of the completion of punch lines, which can be seen as preliminary support for our hypothesis. The second requirement is counterintuitive as well, but for a different reason: Persons who are ''sensitive to their environment'' are usually not expected to be funny. For example, Freud (1905) speculated that exactly the reverse pattern is to be expected. According to him, sensitive persons have a large Superego and hence do not admit joke transfer from the Id to overt behavior. Moreover, the negative relation between psychoticism and social sensitivity (Eysenck and Eysenck 1985) on the one hand and funniness on the other (Köhler and Ruch 1996) also suggests the reverse relation. More specifically, psychoticism is related to creativity, but it is also related to different types of antisocial behavior (Eysenck and Eysenck 1985, p. 14).

Before proceeding, it needs to be stressed that we do not rule out the role of knowledge about the rules to be funny in the production of humor. Rather, the processes we propose focus on the development of such knowledge. Our theory proposes that this knowledge reflects earlier generation and selection of jokes. However, we suspect that most of this knowledge is implicit. Likewise, the role we assign to creativity might seem limited. However, in our approach, creativity refers to the enhancement of the

generation of jokes (i.e. the frequency). That is, creativity indirectly affects funniness because it enhances the frequency of jokes, which is a crucial variable in our theory. However, creativity is not sufficient. In addition to being creative, the joker needs to be sensitive to negative reactions if she wants to become a good joker.

Three studies are conducted to test this theory. The three studies are based on people rating their peers. Although the second study is in essence a replication of the first one, both studies will be discussed separately in the following. Two preliminary remarks need to be made concerning the methodology. First, it has been shown that audiences differ substantially concerning their sense of humor (Ruch 1996; Herzog and Hager 1998). In ideal circumstances, one could control this observer variability by using only one observer. This is not possible, of course, because one person knows only a limited set of people. We have tried, however, to minimize the number of observers in relation to the number of observed people. Secondly, unlike the focus of some other theories (e.g., Attardo and Raskin 1991), ours is on all kinds of funny behaviors and not only on verbal jokes. Therefore, the rater is required to have met the person she evaluates on several occasions. To combine both methodological requirements we just described, we decided to have a limited set of people rate 20 people who are familiar to them.

Study 1

Method

Eleven volunteering students were asked to write down the names of twenty persons from their immediate environment. Then, they were asked to rate each of these persons on three 8-point scale questions (from 0, *not at all*, to 7, *very much so*). The questions were the following.

(1) Does the person often tell things which are meant to be funny? This question does not only concern (complete) jokes, but also remarks, exaggerations, etc. Notice that this question is independent of the fact whether you think the person is funny or not.

This question refers strictly to the frequency of joking. It is stressed that the funniness of the jokes should not be taken into account in this question (technically, Class 1, 2, and 3 responses should not be distinguished).

Second, it is stressed that all kinds of responses (complete jokes, remarks, metaphors, maxims, etc.) should be considered. One could argue that this is an underestimation of the real joking frequency, because people sometimes pre-select themselves. However, we assume this to be a rare phenomenon.

(2) Is the person socially sensitive? This can be seen in many ways: someone who often takes into account other people's opinion is socially sensitive. Also someone who is afraid to be disapproved or ridiculed by others is socially sensitive. Generally, "social sensitivity" concerns being sensitive to what other people think about you.

This question refers to social environment sensitivity in a negative way in the sense that it focuses on reactions to negative experiences (disapproval and ridicule). Although we expect positive reinforcement to be important as well, this variable was not included because it was assumed that the effect of positive reinforcement is more difficult to judge.

(3) Suppose the person says something, which is supposed to be funny. How strongly do you expect this to be a funny remark? Hence, of all intended-to-be-funny remarks (jokes, exaggerations, etc.) that this person makes, how large is the proportion that you really consider funny.

In technical terms, this question refers to the p_u^+/p_u proportion. As can be seen, it is stressed that the absolute frequency should not be judged (p_u^+), but the *relative* frequency.

Responses of all 11 participants were pooled, resulting in a 20×11 by 3 dataset. A bifactorial ANOVA was performed in which "frequency" (question 1) and "sensitivity" (question 2) functioned as independent variables, "funniness" (question 3) as the dependent variable. To make the number of observations per cell large enough, each two adjacent cells were pooled (0 and 1, 2 and 3, etc.), resulting in a four-point scale for both independent variables.

Results

A two-way Analysis of Variance with frequency (4 levels) and sensitivity (4 levels) as independent variables and funniness as dependent variable was conducted. Only the frequency factor was significant ($F(3, 204) = 19.11$, $p < .01$), not the sensitivity factor, ($F(3, 204) = 1.38$, $p > .05$). To

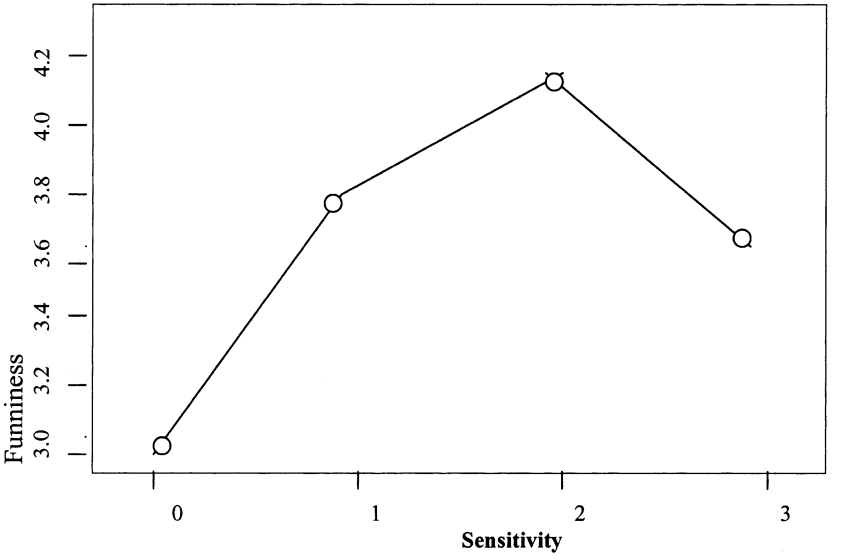

Figure 1. *Funniness as a function of sensitivity*

achieve a more complete picture of our data, an analysis of contrasts was performed. As could be expected, a linear trend was strongly significant for the frequency factor ($F(1, 204) = 83.61$, $p < .01$). For the sensitivity factor, the linear trend was not significant ($F(1, 204) = 0.12$, n.s. 1, the quadratic trend almost was ($F(1, 204) = 3.66$, $p = .057$). This quadratic trend is seen in Figure 1, in which funniness is plotted against sensitivity. Sensitivity and frequency were weakly correlated ($= .12$, $p < .10$). The interaction between frequency and sensitivity was significant ($F(9, 204) = 2.08$, $p < .05$). However, further analyses showed that the linear effect of the frequency factor held for all levels of sensitivity. In some levels, however, the trend was stronger than in other levels, which resulted in the statistically significant interaction.

Discussion

For the frequency variable, the hypothesis clearly holds true: A high joking level is associated with a high level of funniness. On the other hand, sensitivity seems quadratically related to funniness, in the sense that there is a certain "optimal sensitivity point": Being funny seems to require

a certain amount of sensitivity, but not too much. In the selectionist perspective we described earlier, this means that if social selection is too strong, unusual behaviors will be selected away before they have a chance to grow into the more delicate Class-2 zone. Nevertheless, the relation between humorousness and sensitivity was not as strong as is to be expected from our theory. One reason might be that the sensitivity question does not appropriately assess the social sensitivity factor as it was intended to: What we intended to measure was how strongly the person's behavior is influenced (rewarded and punished) by her peers' reactions. On rereading our sensitivity question, it seems that some people might have understood it as a general "shyness" variable, thus creating an unwanted bias in our data. The purpose of Study 2, therefore, is twofold: (1) Replicate the strong relation we found between frequency and humorousness. (2) Construct a question, which more clearly assesses the effect of peers' influences on the judged person's behavior.

Study 2

Method

The method is analogous to that in Study 1, except for the sensitivity question. 16 psychology students volunteered to rate twenty persons on the question 1 and 3 above. The second question became the following:

> Suppose the person tells a story and one of the listeners subtly makes it clear that he or she is not interested in the story. How strongly will this influence the behavior of the speaker? Examples of influence would be that the speaker cuts the story short, stops talking, or talks with less enthusiasm.

Again, the question is focused on only one aspect of peers' reactions (punishment) because this is assumed to be the most easily evaluated variable. It seems more difficult to score the effect of reward on other people's behavior than the effect of disapproval.

Results and discussion

A two-way ANOVA with frequency and sensitivity as independent variables and funniness as dependent variable was conducted. Both independent variables were transformed in the same way as in study 1, which

resulted in four levels for both variables. For the frequency variable, the result was a replication of the previous study ($F(3, 304) = 39.64$, $p < .01$). The effect of the new sensitivity variable was stronger than the previous one ($F(3, 304) = 2.48$, $p = .06$). However, a trends analysis indicated that the effect was still quadratic: The linear trend for sensitivity was small ($F(1, 304) = .97$, n.s.) while the quadratic one was of the same size as in the previous study ($F(1, 304) = 3.55$, $p = .06$). Frequency and sensitivity again were weakly correlated, although the effect was in the opposite direction ($r = -.13$, $p < .02$). The interaction between frequency and sensitivity was not significant ($F(9, 304) = 1.23$, $p > .20$).

The same conclusion holds as in the previous study then: First, the relation between frequency and level of humor is again established. Second, the relation between sensitivity and humorousness is again curvilinear, but weak. One reason why the effect is weak may be because we did not distinguish between the effects of positive and negative appraisal (or, in another terminology, punishment and reward) by peers. Possibly, because of the difficulty of this question, our judges may have combined sensitivity to both positive and negative appraisals, in spite of the negative phrasing of the sensitivity question. Therefore, in a third and final study we decided to explicitly assess both aspects of appraisal (i.e. positive and negative) separately.

Study 3

Method

The method was again similar, except that the social sensitivity variable was split in two, referring, as mentioned in the previous paragraph, to positive and negative appraisals. The negative appraisal question was almost the same as before. This was the exact formulation:

> Suppose the person tells a story and one of the listeners subtly makes it clear that the story is *not interesting*. How strongly will this influence the behavior of the speaker? Examples of influence would be that the speaker cuts the story short, stops talking, or talks with less enthusiasm.

The positive appraisal question was as follows:

> Suppose the person tells a story and one of the listeners subtly makes it clear that the story is *interesting*. How strongly will this influence the behavior of the

speaker? Examples of influence would be that the speaker cuts the story short, stops talking, or talks with less enthusiasm.

Note that only one word (“not”) distinguished between the two questions. Because almost nobody judged their acquaintances to be insensitive to positive appraisal (scores of 0 and 1), we distinguished only three categories of positive appraisal (merging the scores from 0 to 3 into one category).

Results

A three way Analysis of Variance with frequency (4 levels), negative sensitivity (4 levels) and positive sensitivity (3 levels) as independent variables and funniness as a dependent variable was conducted. As in the previous studies, the frequency variable had a strong effect ($F(3, 196) = 15.60$, $p < .01$). The effect of negative appraisal sensitivity approached significance ($F(3, 196) = 2.24$, $p = .08$). The same held for the linear trend ($F(1, 196) = 3.71$, $p = .056$). We found that higher levels of sensitivity were related to higher levels of humorousness. However, the quadratic trend was not significant ($F(1, 196) < 1.0$). Also, the reward sensitivity variable had a nearly significant effect on perceived funniness ($F(2, 196) = 2.45$, $p = .09$). The linear effect was significant ($F(1, 204) = 4.73$, $p < .05$). This time, higher levels of sensitivity result in *lower* levels of perceived funniness. The quadratic trend was not significant: ($F(1, 196) = .48$, n.s.). The interaction between frequency and negative sensitivity was significant ($F(9, 196) = 2.00$, $p < .05$). However, the main effects of frequency held for all levels of sensitivity. The interaction between frequency and positive sensitivity was not significant ($F(6, 196) < 1.0$). The positive sensitivity variable was positively related to frequency: ($r = .33$, $p < .01$), whereas the negative sensitivity variable was negatively related to frequency, although non-significantly ($r = -.2$, $12 > .05$). Finally, both aspects of sensitivity were only weakly related ($r = .13$, $p = .056$), which suggests that participants made a distinction between both questions.

Discussion

First, the results of the third study show that the relation between frequency and quality is reliable. Second, we find that sensitivity to negative

appraisals is positively related to funniness. This is in line with our expectations in the introduction, but not with the findings of the first two studies. Moreover, we find that the sensitivity to positive appraisals is positively related to joking frequency but negatively related to funniness. In sum, we do not find the curvilinear trend. In the discussion sections of the previous studies, we suggested that not only a lack of sensitivity but also too much sensitivity may damage funniness. However, this interpretation might have been premature. The main point of difference between the first two studies and the last one is the dissociation between positive and negative sensitivity. It is likely that observers do not disentangle both aspects of sensitivity if they are not explicitly asked to do so. Therefore, the question measuring sensitivity in the first two studies may refer to both aspects of sensitivity simultaneously. As a result, the inverse-U relation may have been a joint effect of positive and negative appraisal. This is supported by the following analysis. We calculated an average of both types of sensitivity in the third study. This average sensitivity indeed shows an inverse-U relation with humorousness (i.e. the quadratic trend is significant: $(F(1, 216) = 3.94,\ p < .05)$, whereas the linear trend is not $(F(1, 216) = 2.59, p > .10)$. Furthermore, the positive relation between positive sensitivity and joking frequency may reflect simple reinforcement processes. It seems that person who are sensitive to positive appraisals will only succeed in becoming good jokers if they are sensitive to negative appraisals. This sensitivity allows them to fine-tune their jokes and produce class 2 jokes. This interpretation fits nicely in a selectionist framework.

Do funny people make a lot of jokes or does making many jokes produce funny people?

The reader may have a straightforward alternative interpretation for the strong relation between frequency and quality of joking we report. More specifically, persons high on the trait 'humorousness' are believed to make many jokes because they are good at it (e.g., Köhler and Ruch 1996). This interpretation makes sense intuitively. However, the following analysis puts a doubt on this interpretation of our findings. Consider two types of individuals, namely individuals who are good jokers but only rarely joke and non-humorous individuals who do (attempt to) joke frequently. According to the trait interpretation, both types of individuals

should occur in similar but low frequencies. However, from a selectionist perspective, non-humorous individuals who do joke frequently fit well with the theory. They are the persons who generate many jokes but do not fine-tune their jokes. In contrast, good jokers who joke rarely are more problematic to a selectionist theory of humorous behavior. More specifically, because these individuals do not practice, it is not clear how they can become good jokers. In sum, a selectionist perspective expects that persons who are not funny may be both frequent and rare jokers, whereas persons who are funny can only be frequent jokers. A trait interpretation does not make such a prediction.

To test our prediction, we divided our three samples in good jokers (a humorousness score higher than 4) and bad jokers on the one hand and frequent jokers (a frequency score higher than 3) and rare jokers on the other hand. This results in a two by two table. Table 1 shows the relative frequencies of the four cells for the three studies. The rows show the percentage of frequent and rare jokers in relation to joking quality. Both perspectives (i.e. the selectionist and the trait perspective) expect high cell frequencies in the frequent-good cell and the rare-bad cell. The results support this and this relation has been discussed earlier. The cells we are interested in here are the other two cells (in italic). Our theory expects frequent bad jokers to be more numerous than rare good jokers, whereas a trait interpretation does not make such prediction. In the first study, 37.9 percent of the bad jokers ($n = 132$) were frequent jokers, whereas only 20.4 percent of the good jokers ($n = 88$) rarely joke. In the second study, 40.6 percent of the bad jokers ($n = 175$) frequently joke, whereas only 13.8 percent of the good jokers ($n = 145$) rarely joke. In the third study, 51.6 percent of the bad jokers ($n = 126$) frequently joke, whereas only 18.1 percent of the good jokers ($n = 94$) rarely do so. These three differences are significant ($Z = 2.74$, $p < .01$, $Z = 5.29$, $p < .01$, and

Table 1. *The relation between joking frequency and joking quality*

	n	Study 1		*n*	Study 2		*n*	Study 3	
		Joking frequency			Joking frequency			Joking frequency	
		HIGH	LOW		HIGH	LOW		HIGH	LOW
Good Jokers	88	79.6%*	*20.4%*	145	87.2%	*13.8%*	94	81.9%	*18.1%*
Bad Jokers	132	*37.9%*	63.1%	175	*40.6%*	59.4%	126	*51.6%*	48.4%

* should be read as follows: 79.6% of the 88 good jokers of study 1 frequently joke and 20.4% of the same group rarely (attempt to) joke.

$Z = 5.08$, $p < .01$, respectively). Thus, in our three studies, the frequency of good but rare jokers is much smaller than bad but frequent jokers. This finding supports our selectionist interpretation of the relation between joking quantity and quality, and disconfirms a trait interpretation.

General discussion

In this paper we have conceptualized the development of humor as a learning process: Being funny requires making jokes, from which the good ones are retained and the bad ones eliminated. We suppose that what makes a good joke is often beyond explicit knowledge of the joker, although academic knowledge about what is funny and what is not has been growing in recent years (Attardo and Raskin 1991; Veatch 1998). To find out how jokers learn to be funny, two variables of individual differences were distinguished: (1) The frequency of joking: Making many jokes creates a large variety of jokes from which the good ones may be selected. (2) Sensitivity to social responses: Jokes are assumed to be shaped according to the responses of the (social) environment. Persons who are sensitive to their environment will obtain an adequate joking repertoire after some time. Insensitive persons will keep on repeating the same type of jokes, even if peers do not laugh or smile in response and hence will not become good humorists. Two aspects of social sensitivity were distinguished in Study 3.

The first variable indeed seems to be a strong variable of individual differences in humor production. Joking frequency and joking quality are strongly related in the three studies. Moreover, the trait interpretation of this relationship cannot deal with the fact that good but rare jokers are less numerous than bad but frequent jokers in our three samples. This difference supports a selectionist interpretation.

The role of sensitivity is less straightforward. The first two studies made us decide that too much sensitivity to social pressures as well as a lack of it is detrimental for humor. However, the results of the third study shed another light on this puzzling finding. Apparently, the relation between social sensitivity and humorousness depends on the type of sensitivity. Sensitivity to positive feedback only enhances joking frequency, whereas sensitivity to negative feedback enhances joking quality. This last interpretation is more in line with our selectionist hypothesis. The inverted U-relation between sensitivity and joking quality of the

first two studies might well have been a result of the combination of both types of sensitivity. This interpretation was supported by a re-analysis of the data of study three. The relation between average sensitivity (i.e. sensitivity to both types of appraisal) and joking quality was indeed curvilinear and very similar to the relation between sensitivity and quality of the first two studies. In sum, there is some converging evidence that sensitivity to negative appraisals enhances joking quality. However, the relation between sensitivity and joking quality was weaker than we had anticipated. This may be due to the fact that the actual feedback has not been taken into account in our study. A person may very well be socially sensitive, but if the social environment does not provide much feedback, the effect of this sensitivity is necessarily limited.

In the framework we have presented, the effects of both frequency and sensitivity on joking quality can be interpreted as follows: Making many jokes is a necessary condition for becoming a good joker. One has to practice a lot. However, making many jokes is not sufficient for joking quality to come about. In addition to being productive, one has to be sensitive.

Some of our findings need some further discussion. First, we did not find that negative sensitivity is positively related to humorousness (at least in the third study). This seems not in line with the established relation between psychoticism and humorousness because psychoticism and sensitivity are negatively related (Eysenck and Eysenck 1985; Köhler and Ruch 1996). However, psychoticism influences both creativity (and hence frequency) and sensitivity (Eysenck and Eysenck, p. 14). Hence, our theory makes no a priori predictions about the relation between quality and psychoticism. Furthermore, our data suggest that joking frequency facilitates good joking to a larger extent than sensitivity does. This may result in a positive relation between pscyhoticism and humorousness on average. Research tackling this specific question is needed in the future.

A second point that needs to be discussed is the relation between frequency and sensitivity. One might assume that our position leads to the assumption that frequency and negative sensitivity will be negatively related. More specifically, sensitivity may reduce the attempts to joke.[1] However, high sensitivity may also lead to a faster development of a good repertoire. In fact, depending on the relative strength of both factors, one of the two processes may dominate. If initial joking frequency is low, and sensitivity is high, the individual may indeed never reach the delicate balance, because of early pruning. However, if initial frequency as well

as sensitivity is high, an individual may rapidly discover the delicate balance, and hence increase instead of decrease joking frequency. Further research is needed to establish which factors determine these starting conditions.

Finally, we have not mentioned the interaction between frequency and sensitivity. One might assume, starting from a selectionist approach, that both factors will strengthen each other. That is, the effect of sensitivity will only show itself if the initial frequency of joking is high. However, there are good reasons to believe that high joking frequency may compensate a lack of sensitivity. Given enough time, an individual with low sensitivity to negative appraisal will eventually discover the delicate balance, provided that starting frequency is high enough. Thus, the interaction seems to be moderated by time-effects. Our method was not designed to assess such long-term processes, which is why we have not mentioned predictions about the interaction. Furthermore, the interaction between negative sensitivity and joking frequency we find in the first and the second study are ordinal interactions. This means that only the strength of the relations between the independent variable and joking quality is affected by the other variable, and not its direction. To tackle the specific nature of the developing process, longitudinal studies are required with novice jokers (for instance primary school kids) as participants.

In conclusion, the three studies suggest that a selectionist account of humor production may be fruitful. We found that joking frequency facilitates the quality of humor. A trait interpretation of this relationship was less plausible after additional analyses. Furthermore, our data suggest that sensitivity to negative social feedback plays a role in the establishment of good jokers. Sensitive people are able to fine-tune their jokes. In sum, the results of the three studies are well interpreted in a selectionist framework. One can become a good joker only by trying out many jokes and being sensitive to negative social reactions.

Notes

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1. We thank an anonymous reviewer for bringing up this point.

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