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Cognitive and affective determinants of generic drug acceptance and use: cross-sectional and experimental findings

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An increase in generic substitution could be a viable approach to reduce global healthcare expenditures. In many countries, however, generic drug use is rather low. This study examines cognitive predictors (knowledge and beliefs) and affective predictors (general affect and sacred values) to explain generic drug acceptance and use. Data for the study come from a random postal survey conducted in Switzerland (N = 668). A detailed knowledge scale about generic drugs was developed. In addition, an experimental choice task was constructed in which respondents chose between branded and generic drugs. Generic drug acceptance as well as drug choices were influenced by knowledge, beliefs, and affect. It was also found that generic substitution is chosen less frequently for a more severe illness. Key insights could be used for developing information material or interventions aimed at increasing the substitution of generic drugs in order to make health care more affordable.

Keywords: generics; health care; knowledge; beliefs; affect

In an aging society, health is more valued than ever. Health spending is rising faster than the gross domestic product in most of the developed countries, and one of the main cost drivers is the increase in pharmaceutical expenditures (OECD, 2011; Watson, 2006). The use of generic drugs could be one way to curb health expenditures without sacrificing patient care. A generic drug is identical to a brand-name drug in dosage form, safety, strength, route of administration, quality, performance characteristics, and intended use, but generally much cheaper than a branded drug (FDA, 2013).

In many countries, however, generic drug use is rather low. Besides structural reasons for a low use of generic drugs (Decollogny, Eggli, Halfon, & Lufkin, 2011; Granlund, 2009; Paris & Docteur, 2007), it has been suggested that people's beliefs and attitudes are probably the main barrier of generic substitution (Decollogny et al., 2011; Hassali, Shafie, Jamshed, Ibrahim, & Awaisu, 2009). In fact, recent evidence suggests that many people have mixed feelings towards the use of generic drugs (Gaither, Kirking, Ascione, & Welage, 2001; Hassali et al., 2009; Himmel et al., 2005). On the one hand, people think that generic drugs are better value for money and agree that people, in general, should use more generics (Shrank, Cox, Fischer, Mehta, & Choudhry, 2009). On the other hand, far fewer are eager to use generics themselves, suggesting that positive views about the use of generic drugs do not necessarily translate to an increased use (Gaither et al., 2001; Hassali et al., 2009; Shrank, Cox, et al., 2009). In addition, studies have shown that the likelihood that a person chooses or accepts a generic product decreases with the perceived seriousness of an illness and also depends on demographic and socio-economic characteristics such as income and education (Figueiras, Cortes, Marcelino, & Weinman, 2010; Figueiras, Marcelino, & Cortes, 2008; Gaither et al., 2001; Hassali et al., 2009).

The present study discusses and examines different possible predictors of generic drug use and acceptance and aims to identify the strongest cognitive and affective drivers of generic drug evaluations. Eventually, these results could help to explain why, in many countries, generic drug use is rather low. In addition, some of the key insights could be used for developing information material or interventions aimed at increasing the substitution of generic drugs in order to reduce healthcare costs.

Drivers of generic drug acceptance and use

A dominant and straightforward explanation for the fact that many people reject generic substitution could be that

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people lack knowledge about generic drugs. In fact, people's knowledge about generic drugs has been identified as an important predictor of consumers' views (Al-Gedadi, Hassali, & Shafie, 2008; Hassali, Kong, & Stewart, 2005; Himmel et al., 2005; Pereira et al., 2005). In these studies, however, knowledge was often measured by single items that captured only a very specific aspect of knowledge. For example, people were asked if they were able to define what a generic drug is (Al-Gedadi et al., 2008), if they were familiar with the term "generic medicine" (Hassali et al., 2005), or if they had already heard of the difference between brand-name drugs and generics (Himmel et al., 2005).

A broader assessment of knowledge and beliefs in regard to generic drugs was conducted by Figueiras et al. (2009) who developed a measure based on Likert-scale items to measure lay beliefs about generic medicines. However, the scale consists of both knowledge and belief items, which makes it difficult to disentangle the effect of knowledge and beliefs on acceptance of generic drugs. For belief items, there is no agreement among experts on the correctness of the items (Cousin & Siegrist, 2008). In addition, knowledge scales typically consist of binary (right/wrong) scored items that can be ranked according to their difficulty, which requires a non-parametric item response model such as the Mokken model (Mokken & Lewis, 1982). The construction of a psychometrically sound knowledge scale is, therefore, a necessary first step to estimate the unbiased influence of knowledge on preferences for generic substitution.

In addition to cognitive predictors such as knowledge and beliefs, the decision to accept or to reject generics could also be driven by affective predictors. Affect is considered as the specific quality of "goodness" or "badness" (1) experienced as a feeling state (with or without consciousness) (2) demarcating a positive or negative quality of a stimulus (Slovic, Finucane, Peters, & MacGregor, 2002). The reliance on feelings in decision-making can be characterised as "the affect heuristic" (Slovic et al., 2002). Various researchers have emphasised the importance of affect in health-risk perception (Betsch, Renkewitz, Betsch, & Ulshofer, 2010; Chapman & Coups, 2006; Schwartz, Peshkin, Valdimarsdottir, Tercyak, & Taylor, 2005; Slovic, Peters, Finucane, & MacGregor, 2005). It has been suggested that reliance on affect during decision-making could be particularly great in cases of stress and time pressure, but also in cases of ill health (Slovic et al., 2005). In a similar vein, investigators have found that worry impacts health-related behaviour (Chapman & Coups, 2006; Diefenbach, Miller, & Daly, 1999; Hall, French, & Marteau, 2009; Hay, McCaul, & Magnan, 2006; McCaul, Schroeder, & Reid, 1996). Therefore, it stands to reason that affect may also guide people's choices when they make decisions about generic substitution.

Several measures of affect have been suggested in the health-risk literature. Among those, affective imagery has been widely used to assess affect within the framework of the affect heuristic and is typically measured in a two-step approach (Slovic et al., 2002). In the first step, a person associates freely about a certain cue (such as "generic drug") and reports anything that may cross his or her mind. These qualitative, idiosyncratic responses can be analysed in order to examine the core images that are most frequently connected with a certain cue. In a second step, the respondents are asked to evaluate each image on a scale ranging from negative to positive. The mean values of these ratings can be viewed as a quantitative indicator of the affect evoked by a cue that can be related to other psychometric variables. Researchers have used affective imagery to examine the affective meaning of various risks, including adolescent health-threatening behaviours (Benthin et al., 1995), blood transfusion (Finucane, Slovic, & Mertz, 2000), global warming and climate change (Leiserowitz, 2005), as well as various technologies (Connor & Siegrist, 2011; Dohle, Keller, & Siegrist, 2012; Keller, Visschers, & Siegrist, 2012a, 2012b). To our knowledge, affective imagery has never been used to investigate affective responses towards generic drugs.

Another potential affective predictor of generic drug acceptance and use could be related to values. For many people in developed countries, health is not a pricing issue. Instead, they believe that only the best treatment is good enough for their health; thus, health can be considered as a sacred value for many individuals. Sacred values are absolute values that are protected from tradeoffs (Fiske & Tetlock, 1997; Tanner, Ryf, & Hanselmann, 2009; Tetlock, 2003). It has been shown that tradeoffs involving sacred values tend to be more negatively emotion-laden than trade-offs not involving sacred values (Hanselmann & Tanner, 2008). It is possible that individuals who valuate health above all other things (i.e. who consider health as a sacred value) will be satisfied only with the best or priciest option. Therefore, they will be less willing to accept a generic drug, especially when they believe that generic drugs are less effective and provide less value than branded drugs.

The present study

Generic drug use is particularly low in Switzerland. In a review of the Swiss health system, the OECD and the World Health Organization (WHO) stated that it is important to reduce unnecessary expenditure on medicines through a more systematic use of generics to keep Swiss health services accessible and affordable (OECD/WHO, 2011). In fact, the generic drug market accounts for only 12% of the total pharmaceutical market, which is significantly lower than in many other European countries (Paris & Docteur, 2007). Given the apparent high disapproval of generic drugs, Switzerland was determined to

be most suitable to study common barriers of generic drug acceptance and use.

The aims of the study were threefold. The first aim of the present study was to estimate if generic drug acceptance and use could be explained by cognitive determinants, affective determinants, or both. For this purpose, we constructed an experimental choice task in which people had the choice between a branded and a generic drug, and we also varied the seriousness of the illness. A second aim of the present study was to develop a psychometrically sound knowledge scale to assess knowledge about generic drugs in a more detailed manner. This will allow disentangling the influence of knowledge from commonly held beliefs about generic drugs. Third, by the use of affective imagery, this research sought to explore the core affective images that are most frequently connected with generic drugs.

Method

Participants

The data for the study come from a mail survey conducted in the German-speaking part of Switzerland. A questionnaire and an accompanying letter were sent to a random sample of addresses from the telephone book. The household member over 18 years of age whose birthday was closest to the date that the questionnaire was received was asked to fill out the survey. Two reminders were sent out to non-respondents, and the final response rate was 37% (N = 668). The mean age was 55 years (SD = 16). Fifty per cent (n = 332) of the respondents were women, and 50% (n = 332) were men. Six participants (0.9%) did not report their age, and four participants (0.6%) did not report their gender. The self-reported education level ranged from primary and lower secondary school (8.3%; n = 56) and upper secondary vocational school or upper secondary university preparation school (55.9%; n = 373) to college or university (33.8%; n = 226). Thirteen respondents (1.9%) did not indicate their education level.

Questionnaire

The questionnaire was designed to measure various constructs related to generic drugs. The wording of all items measured on a Likert scale and the corresponding scale reliabilities (Cronbach's α) are presented in Table 1. Knowledge items can be found in Table 2. An experimental choice task was presented at the end of the questionnaire and was followed by demographic questions.

Affective imagery

First, participants were asked to associate freely about the term "generic drugs". That is, they were asked to write down the first three thoughts or images that came to mind when they thought about generic drugs. Generic drugs were defined as drugs with the same composition but with a different name compared to branded drugs. Participants rated each association on a scale ranging from *very negative* (−3) to *very positive* (+3). The mean value of these ratings is used as a quantitative proxy for the affect associated with generic drugs.

Health as sacred value

Health as a sacred value was assessed using the sacred values measure (SVM) proposed by Tanner and colleagues (Hanselmann & Tanner, 2008; Tanner et al., 2009). Answers were given on a seven-point scale ranging from *don't agree at all* (1) to *totally agree* (7). Two items were reverse scored. Higher scores of the SVM indicate that participants more strongly endorsed the notion that health is a sacred value.

Knowledge

Twenty-two knowledge items were used to assess objective knowledge. The items were true/false questions and could be answered by using the response options *true*, *wrong*, or *don't know*. To ensure content validity, initial questions of the knowledge scale were reviewed by two professors of pharmacology of two large Swiss universities, as well as by two experts from the Swiss Federal Institute of Public Health. Some items that were considered as incorrect, imprecise, or unclear by the experts were rephrased or removed from the questionnaire. Twelve items were adopted from the generic medicines scale (GMS) suggested by Figueiras et al. (2009). The wording of some GMS items was changed to avoid ambiguity. For example, the item "Generic medicines have the same side effects than brand medicines" was rephrased to "The active ingredients in generic drugs have the same side effects as active ingredients in brand drugs" to account for the fact that side effects from inactive ingredients may vary.

Beliefs

The belief scale consisted of 12 items. In contrast to the knowledge items, the correctness of these answers remains an open question from an objective point of view. Therefore, instead of using a true/false format, answers could be given on a seven-point scale ranging from *don't agree at all* (1) to *totally agree* (7). Some items described possible benefits of generic drugs for society, while others focused on possible risks. Five items were adopted from Shrank and colleagues (Shrank, Cox, et al., 2009) and comprised beliefs about value for money, generics for society, and the role of the government or insurers in increasing generic use. A mean value was calculated after recoding two items. High values on this scale

Table 1. Item wording, means (*M*), standard deviations (SD), and Cronbach's alpha (α) of the scales used in the questionnaire.

Scales	*M*	SD	α
SVM	**4.58**	**0.97**	**0.55**
Health is about something …			
1. … that we should not sacrifice, no matter what the benefits (money or something else)	5.54	1.45	
2. … which one cannot quantify with money	6.20	1.29	
3. … for which I think it is right to make cost–benefit analyses. (R)	3.00	1.76	
4. … for which I can be flexible if the situation demands it. (R)	2.94	1.59	
5. … that involves issues or values which are inviolable	5.26	1.68	
Beliefs	**5.23**	**0.85**	**0.73**
1. Generic drugs could help fight diseases in developing countries	5.95	1.32	
2. It should always be allowed to approve generic drugs, regardless of whether the patent of the brand drug has expired or not; this would then ensure that poor people have access to these drugs	4.92	1.97	
3. The introduction of generic drugs forces researchers and pharmaceutical companies to conduct research into new drugs	4.44	1.84	
4. Cost savings from generic drugs help to create financial scope for expensive pharmaceutical innovations	4.20	1.93	
5. Generic drugs help to enhance cost-consciousness in the health care system.	5.88	1.41	
6. In the long term, generic drugs will create a two-class society. (R)	5.12	1.87	
7. Producers of generic drugs profit disproportionately from the achievements of other researchers or pharmaceutical producers. (R)	3.87	1.66	
8. Generic drugs are a better value than brand-name drugs[a]	5.75	1.47	
9. Swiss people spend too much money on prescription drugs[a]	6.02	1.39	
10. Swiss people should use more generic drugs[a]	6.02	1.40	
11. The government should create new rules to increase generic drug use in Switzerland[a]	5.24	1.89	
12. Healthcare insurance companies should create new rules to increase generic drug use[a]	5.25	1.86	
Acceptance of generic drugs	**4.24**	**1.42**	**0.85**
1. When I receive a new prescription from my doctor, I often ask if a cheaper generic option is available[a]	4.53	2.09	
2. I feel comfortable asking my doctor to substitute a generic form of a brand-name medication[a]	5.01	1.96	
3. At the pharmacy, I often ask if a cheaper generic option is available.[a]	4.55	2.07	
4. I feel comfortable asking my pharmacist to substitute a generic form of a brand-name medication[a]	4.75	2.01	
5. I don't mind when my pharmacist switches my prescription to a generic medication.[a]	5.16	1.93	
6. I often search the Internet to figure out if a drug has a generic equivalent	2.23	1.71	
7. At an online pharmacy, I would specifically search for generic drugs	2.74	2.09	
8. I would be willing to solely receive and use generic drugs if my health insurance contribution would be lower in return	4.81	2.18	
Health status	**5.68**	**1.08**	

Note: All items were measured on seven-point Likert scales; high values express high agreement.
[a]Adapted from Shrank and colleagues (Shrank, Cadarette et al., 2009; Shrank, Cox et al., 2009). *R* = reverse scored.

indicted that a person has more favourable beliefs in regard to generic drugs. A varimax rotated principal component analysis was conducted to explore dimensionality of the scale. According to the scree-plot, a solution with one principal component was sufficient to explain the correlations (30.1% variance explained).

Acceptance of generic drugs

Acceptance of generic drugs comprised active request for generic drugs (two items), comfort with generic drug prescription (two items), and comfort with generic substitution (one item); all these items were adapted from Shrank and colleagues (Shrank et al., 2009; Shrank, Cox, et al., 2009). In addition, we used two newly developed items that were related to Internet searches and online pharmacies. Respondents were also asked about their acceptance of a selectable Swiss insurance condition that obliges the insured person to use generic drugs (one item). Responses to the questions were given on seven-point scales ranging from *don't agree at all* (1) to *totally agree* (7). Dimensionality of the scale was explored using the varimax rotated principal components analysis. The analysis (scree-plot) showed that one factor was sufficient to explain the correlations between the items; the solution accounted for 50.2% of the total variance.

Drug choices

At the end of the questionnaire, participants were confronted with two clinical scenarios. In the scenario that was presented first, respondents were asked to assume that they had just been diagnosed with influenza, and that the doctor recommended antipyretic medical treatment. In the second scenario, respondents were asked to imagine that they were diagnosed with thrombosis; again, the doctor recommended medical treatment. For each scenario, participants could choose between a branded drug and the generic equivalent. Participants were also asked how much they would agree if the doctor would prescribe

Table 2. Knowledge scale: items, per cent correct answers and scalability coefficient of the items (H_i).

Item	True/ false	Per cent correct	H_i
Generic drugs are cheaper because they are less efficacious[a]	F	91	0.62
Generic drugs are used for the same illnesses[a]	T	89	0.49
Generic drugs have a different box from brand drugs[a,b]	T	87	–
Generic drugs are purely herbal products and refrain from chemical agents	F	86	0.52
In contrast to brand drugs, generic drugs are produced on a natural basis	F	85	0.46
Generic drugs are good for less serious diseases[a]	F	85	0.50
Generic drugs are made with lower quality substances[a]	F	84	0.50
Generic drugs are as effective as brand drugs[a]	T	83	0.49
Generic drugs have the same effect as brand drugs[a]	T	83	0.45
Treatments with generic drugs take longer[a]	F	82	0.55
Generic drugs take a longer time to be efficacious[a]	F	81	0.58
Oftentimes, you have to take double the amount of the active ingredient of a generic drug to have the same effect as the brand drug	F	78	0.50
Compared with brand drugs, generic drugs have been on the market a shorter period of time, so they carry more risks and side effects	F	74	0.51
Generic antibiotics are less efficacious than brand antibiotics[a]	F	68	0.55
Physicians who are allowed to dispense drugs to their patients on their own account don't dispense generic drugs[b]	F	67	–
The active ingredients in generic drugs have the same side effects as active ingredients in brand drugs[a]	T	65	0.44
Producers of generic drugs have to incur less research expenditures for the development of their drugs[b]	T	61	–
Generic drugs have a better quality control than brand drugs[a]	F	55	0.45
Generic contraceptives are as safe as brand contraceptives	T	51	0.56
Generic drugs can contain different inactive ingredients than brand drugs[b]	T	48	–
Generic drug producers and brand drug producers have to spend an equal amount of money for patent protection	F	39	0.45
In the Swiss health insurance system, the patient copayment amount for drugs is always the same[b]	F	29	–

Notes: $N = 668$; $H = 0.51$; $\rho = 0.90$. Data are sorted in descending order of correct response rates.
[a]Adapted from Figueiras et al. (2009).
[b]Not included in the final Mokken scale.

them a generic drug. Answers were given on a seven-point scale ranging from *don't agree at all* (1) to *totally agree* (7).

Demographic characteristics

Self-reported socio-demographic characteristics were gender, age, and net household income ranging from *less than 1000 CHF* (1) to *more than 10,000 CHF* (4). Education was categorised as *low* (primary and secondary school), *medium* (vocational school), and *high* (college and university). General health status was assessed on a seven-point scale ranging from *very bad* (1) to *very good* (7).

Data analysis

IBM SPSS Version 19 for Mac (SPSS, Inc, Chicago, IL) was used to perform multivariate analyses, including linear and logistic regression analyses. To analyse affect-laden imagery elicited by free word associations related to generic drugs, we used UCINET 6 for Windows, which is a software package for the analysis of network data. NetDraw, which is part of the UCINET 6 package, served as a tool to visualise the affective imagery network.

The knowledge scale was evaluated using the Mokken method (Gillespie, Tenvergert, & Kingma, 1987; Mokken & Lewis, 1982). The Mokken model can be viewed as a stochastic elaboration of Guttman's scale analysis. Mokken analysis includes testing the assumptions of unidimensionality and cumulativeness of the scale, which is evaluated by means of Loevinger's scalability coefficient H and the reliability of the scale, i.e. coefficient Rho (ρ). The scalability coefficient H ranges from 0 to 1.00, where a greater value indicates a stronger unidimensional cumulative scale. Values between 0.30 and 0.40 indicate a weak scalability; values between 0.40 and 0.50 indicate a medium scalability, and values higher than 0.50 indicate a strong unidimensional cumulative scale (Mokken & Lewis, 1982). The quality of an item is indicated by H_i, and each item requires a coefficient of homogeneity $H_i > 0.30$. In addition, Rho should be > 0.70. To evaluate the assumptions of a Mokken model, the statistic program MSPWIN 5.0 was used.

Results

Affective imagery

The majority of respondents indicated a first association ($n = 620$, 48 missing), a second association ($n = 591$, 77 missing), and a third association ($n = 543$, 125 missing).

Higher educated participants generated more associations compared to lower educated participants ($r = 0.249$, $p < 0.001$).

Generally, affect associated with generic drugs was rather positive than negative ($M = 1.17$, SD = 1.29) and differed significantly from zero, $t(614) = 22.34$, $p < 0.001$. To analyse affect-laden imagery elicited by free word associations to generic drugs, the images that were expressed by participants were categorised first. A first rater assigned the associations to 25 general categories. A second rater who was not previously involved assigned 100 randomly chosen associations to one of the 25 general categories. Inter-rater reliability (Cohen's kappa) was very good ($\kappa = 0.80$). Associations that were not assigned to the same category were discussed and assigned to one category. Using network analysis, associations were explored in more detail. Because respondents were asked to express three words or images related to generic drugs, it was also possible to analyse how often one association was mentioned in combination with another association. Figure 1 illustrates a visualisation of the association network. The "spring embedding" algorithm (Hanneman & Riddle, 2005) was used to create the network layout. Spring embedding moves closely connected nodes towards the centre of the graph, while less connected nodes move to the periphery. Thus, the centre of the graph represents the core associations related to generic drugs.

The network analysis revealed that associations subsumed under the categories "cheap" ($n = 476$) and "alternative" ($n = 355$) were by far the most mentioned categories, and they were also closely connected (Figure 1). The associations "advertisement" ($n = 10$), "foreign" ($n = 10$) and "packaging" ($n = 19$) occurred only rarely. The node colour indicates the mean rating of the category. Black nodes show positive categories (rating ≥ 0.5 to +3), grey nodes neutral categories (rating between −0.5 and 0.5), and white nodes indicate negative categories (rating $\leq$ −0.5 to −3). The most positive associations were "reasonable" ($M = 2.34$, SD = 1.03, $n = 77$) and "cheap" ($M = 2.29$, SD = 1.05, $n = 476$); the most negative associations were related to "uncertainty" ($M = -1.19$, SD = 0.97, $n = 25$) and "pharmaceutical industry" ($M = -1.46$, SD = 1.87, $n = 37$).

Knowledge scale

As a first step, items were recoded so that 1 was assigned to correct answers, and 0 was assigned to incorrect or *don't know* answers. The following Mokken scale analysis indicated that five items had to be excluded from the knowledge scale due to low H_i values. The final scale consisted of 17 items (Table 2). The Loevinger's scalability coefficient H indicted a strong unidimensional cumulative scale ($H = 0.51$); in addition, the scale was also found to be highly reliable ($\rho = 0.90$). A summative index was computed, with high values indicating high knowledge of generic drugs. On average, respondents showed medium to high knowledge about generic drugs ($M = 12.72$, SD = 4.22).

Beliefs

Respondents rather agreed than disagreed with many of the beliefs items ($M = 5.23$, SD = 0.85), indicating that many people had rather positive views about generic drugs. Strong beliefs were expressed in regard to generics and society (Table 1); many respondents agreed that the Swiss spend too much on prescription drugs ($M = 6.02$, SD = 1.39) and should use more generic drugs ($M = 6.02$, SD = 1.40). In addition, many people view generic drugs as helpful to fight disease in developing countries ($M = 5.95$, SD = 1.32) and do not feel that producers of generic drugs profit disproportionately from other researchers or pharmaceutical producers ($M = 3.87$, SD = 1.66).

Acceptance of generic drugs

The multiple linear regression for acceptance of generic drugs explained 41% of the variance (Table 3). Three variables showed a significant effect. Beliefs was the strongest predictor ($\beta = 0.492$, $p < 0.001$), followed by knowledge ($\beta = 0.187$, $p < 0.001$). Respondents with more positive beliefs and higher knowledge were more likely to accept generic drugs. Affect ($\beta = 0.116$, $p = 0.001$) and was also significant: Participants with more positive affect towards generic drugs were more likely to accept generic drugs.

Choice task

The drug choices differed according to the seriousness of the illness. In the Flu condition, 90.2% decided to choose the generic drug. In the Thrombosis condition, only 79.9% chose the generic drug. This difference was statistically significant (McNemar's test, $p < 0.001$). Multiple logistic regression was applied to explain the drug choices in the two conditions (Table 4). Beliefs (Flu: OR = 3.75, $p < 0.001$; Thrombosis: OR = 2.93, $p < 0.001$), knowledge (Flu: OR = 1.18, $p < 0.001$; Thrombosis: OR = 1.17, $p < 0.001$), and affect (Flu: OR = 1.52, $p < 0.01$; Thrombosis: OR = 1.29, $p < 0.05$) were associated with a greater probability to chose the generic drug over the branded drug. In addition, health status was a significant predictor in the thrombosis condition (OR = 1.27, $p = 0.05$). Using Nagelkerke's statistic (pseudo R^2), the multiple logistic regression model in the Flu condition explained 45% of the variance, while the regression model in the Thrombosis condition explained 37% of the variance.

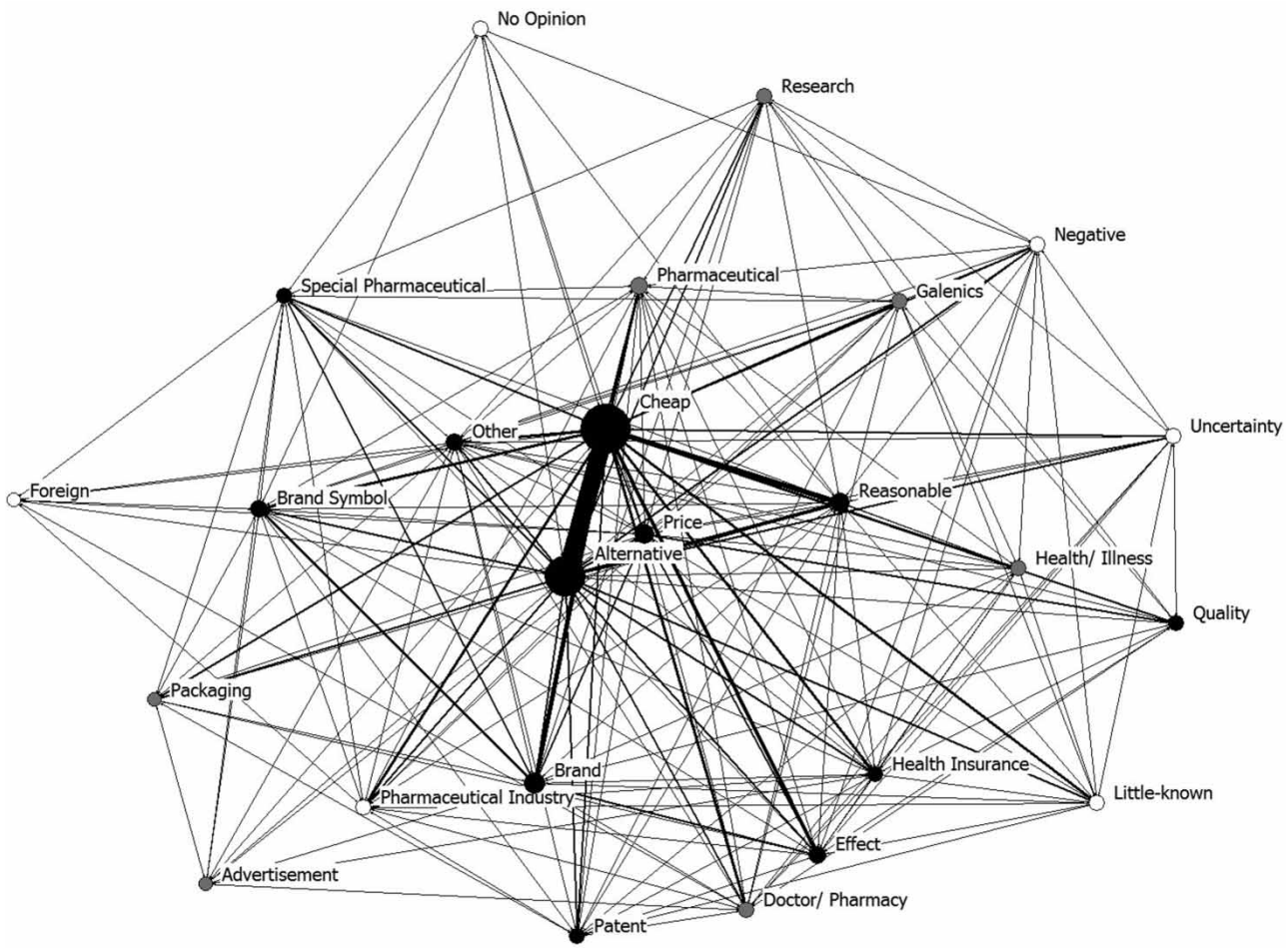

Figure 1. Network visualisation and affective imagery elicited by free associations to generic drugs. Nodes are sized according to the frequency with which each category was generated. Node colour shows mean rating of the category (black = positive; grey = neutral; white = negative). Tie strength denotes how often a category was mentioned in connection with another category.

Discussion

The present research examined both cognitive predictors (such as knowledge and beliefs) and affective predictors (such as general affect or sacred values) of generic drug acceptance and use. An important prerequisite for the present research was the development of a unidimensional scale for assessing knowledge of generic drugs. A Mokken analysis revealed a strong unidimensional cumulative scale

Table 3. Multiple linear regression predicting acceptance of generic drugs (n = 583).

	B	SE B	β	p-Value
Constant	−0.861	0.548		0.117
Gender (male)	−0.138	0.093	−0.049	0.139
Age	0.002	0.003	0.017	0.626
Education				
Low verus medium	0.103	0.195	0.036	0.599
Low versus high	0.031	0.200	0.011	0.876
Income	−0.044	0.059	−0.026	0.455
Health status	0.078	0.044	0.059	0.076
Affect	0.125	0.038	0.116	**0.001**
SVM	−0.093	0.048	−0.063	0.054
Knowledge	0.066	0.013	0.187	**0.000**
Beliefs	0.817	0.060	0.492	**0.000**

Notes: Adjusted R^2 = 0.41. Significant p-values at 95% confidence level are printed in bold.

Table 4. Multiple logistic regression predicting generic drug choice for flu and thrombosis.

	Flu					Thrombosis				
	B	Odds ratio	95% CI		*p*-Value	B	Odds ratio	95% CI		*p*-Value
Constant	−5.48	0.00			0.012	−7.27	0.00			0.000
Gender (male)	0.16	1.17	0.56	– 2.46	0.682	−0.12	0.88	0.53	– 1.46	0.630
Age	0.01	1.01	0.98	– 1.03	0.543	0.02	1.02	1.00	– 1.03	0.067
Education									–	
Low versus medium	−0.19	0.83	0.19	– 3.64	0.801	0.67	1.96	0.69	– 5.56	0.207
Low versus high	0.19	1.21	0.26	– 5.71	0.813	0.29	1.33	0.46	– 3.86	0.596
Income	−0.45	0.64	0.38	– 1.06	0.080	−0.21	0.81	0.59	– 1.12	0.203
Health status	0.26	1.30	0.93	– 1.81	0.125	0.24	**1.27**	1.00	– 1.60	0.050
Affect	0.42	**1.52**	1.13	– 2.05	0.006	0.26	**1.29**	1.05	– 1.59	0.014
SVM	−0.29	0.75	0.50	– 1.11	0.151	−0.19	0.83	0.64	– 1.08	0.169
Knowledge	0.17	**1.18**	1.10	– 1.27	0.000	0.16	**1.17**	1.10	– 1.25	0.000
Beliefs	1.32	**3.75**	2.34	– 5.99	0.000	1.08	**2.93**	2.10	– 4.10	0.000

Notes: Flu: $n = 578$; Nagelkerke's $R^2 = 0.451$. Thrombosis: $n = 576$; Nagelkerke's $R^2 = 0.374$. 95% CI = 95% confidence interval; significant odds ratios are printed in bold.

consisting of 17 items. Few items needed to be excluded, and these rejected items contained knowledge related to the Swiss health insurance system, such as patient copayment or drug dispensation. Thus, the resulting scale is not connected to a specific country or healthcare system and would be a suitable and reliable tool for cross-cultural research on the issue.

Most people were quite knowledgeable about generic drugs; they correctly assumed that generic drugs are used for the same illnesses and that they have different packaging than branded drugs. Other items, however, had a higher percentage of wrong answers, indicating important knowledge gaps. In particular, people seem to have misconceptions about the process of generic drug regulation. When a patent for a brand-name drug expires, a company can ask for approval of a new generic variant of the branded drug. Thus, generic drug companies do not have to pay for patent protection because the patent has already expired – a fact of which many people seem to be unaware. In addition, generic drug applications generally are not required to include clinical testing to establish safety and effectiveness (FDA, 2013). The guidelines for quality control during production, however, are the same for generic drugs and branded drugs. The high percentage of wrong answers to items related to generic drug regulation indicate that these facts seem to be unknown by many people. In contrast to knowledge, beliefs cannot be considered correct or wrong from an objective point of view. They rather mirror general views that people have about generic substitution. In sum, beliefs about generic drugs in the present sample were rather favourable, which is in line with other studies (Shrank, Cox, et al., 2009).

Results from affective imagery point in the same direction. The associations that were mentioned in response to generic drugs were generally favourable; the average affect rating across all associations was positive and predicted generic drug acceptance and generic drug choices. A network visualisation was chosen to allow for a qualitative and detailed analysis of the core associations related to generic drugs. These core associations, such as "alternative", "cheap", or "price" were frequently mentioned, positive, and highly connected. A network perspective on spontaneous reactions related to health has been adopted elsewhere (Panzer & Renner, 2009), but has not been used to analyse the affective imagery within the framework of the affect heuristic. A network perspective could be a fruitful new avenue to examine affective imagery related to health because it allows for visualising the core associations, connections between associations, and strength of connections between associations. In addition, core associations could be different among different groups of people, and network characteristics such as size, density, or centrality (Hanneman & Riddle, 2005) could be used to compare association networks of different groups. For generic drugs, for example, it is possible that core associations differ among patients, pharmacists, and physicians, but further work will be required to verify this speculation.

The present research demonstrated that knowledge, beliefs, and affect are the main determinants of generic drug acceptance, and results from the drug choice experiment point in a similar direction. In line with other studies (Figueiras et al., 2008, 2010; Gaither et al., 2001), we found that generic substitution is chosen more frequently for a less severe illness like flu. Regardless of the seriousness of the illness, however, we found that knowledge, beliefs, and affect explain people's choices. Thus, this work provides straightforward applied implications for health practitioners and public health policies. Increasing knowledge appears to be an efficient intervention to increase generic substitution. In line with this assumption, there is evidence that counselling about generics may

reduce the number of patients who are dissatisfied with the generic substitution (Gill, Helkkula, Cobelli, & White, 2010; Himmel et al., 2005). The development of targeted information material would be desirable in this regard, and the knowledge gaps that were identified in the current study could yield a starting point for interventions aimed at increasing people's knowledge. In addition, it is worth considering the current findings in relation to work in the domain of the affect heuristic. According to Alhakami and Slovic (1994), affect should also be connected to the perceived risks and benefits. Thus, providing information about benefits should change the overall affective evaluation and perception of risks (Finucane, Alhakami, Slovic, & Johnson, 2000; Slovic et al., 2002). It is, therefore, possible that information that emphasises the various benefits of generic drugs should lead to a more positive overall affect that would, in turn, increase acceptance of generic drugs.

In this study, we found no evidence that sacred values have an influence on acceptance or choices in regard to generics. This could be due to methodological factors. In former studies and for a variety of topics, the SVM was shown to have good internal consistency, typically yielding a Cronbach's alpha higher than 0.79 (Hanselmann & Tanner, 2008; Tanner et al., 2009). Cronbach's alpha was rather low in the present study; thus, it is possible that the effect of values on drug acceptance and choices were masked by measurement issues.

The use of self-reports about generic drug acceptance is also limited in certain respects. Questions about acceptance could elicit a demand effect; as a result, people's questionnaire responses could be different compared to real-life choices. The forced choice task was intended to mitigate these demand effects; however, it would have been preferable to have additional data about actual drug choices. In addition, the study's design was cross-sectional and did not allow the determination of causal effects. On the other hand, the cross-sectional survey design made it possible to examine a broad range of possible predictors and to include respondents with various demographic and socioeconomic characteristics. Notably, the large-scale survey also allowed the development of a valid and reliable knowledge scale. A particularly interesting avenue for future research would be to use this scale in other countries, but also in different groups such as pharmacists or physicians. Physicians heavily influence the choice of medication, and their prescribing practices – including generic substitution – vary to a large extent (Decollogny et al., 2011; Granlund, 2009). Future research may want to investigate how far the predictors of this study also determine decisions of health care professionals.

In sum, this study demonstrates that people's decisions to accept or to reject generic substitution are driven by cognitive and affective factors. Many people are already knowledgeable about generic substitution; however, we also identified important knowledge gaps. Thus, insights from this study could contribute to the development of information material or interventions aimed at increasing the substitution of generic drugs in order to make health care more affordable.

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