



Review

Structural comparison and consumer choice

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Abstract

Psychological research has demonstrated important parallels between the structural alignment process involved in judgments of similarity and the processes that are involved in analogical reasoning. Gradually, this work on comparisons was applied to consumer choice. In this paper, we review the influence of structural alignment on choices among a set of options. Then, we discuss extensions of this work to comparative advertising and to the role of analogy in marketing communication. Finally, we discuss important extensions to structural alignment suggested by this work such as the key role that affect plays in comparisons made during the choice process.

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Contents

Structural alignment and comparison	0
Comparison of options in choices	0
Common and distinctive features in choice.	0
Structural comparison and choice.	0
Comparative and competitive advertising.	0
Using comparisons to communicate	0
Future directions	0
References	0

It is a truism to say that consumers buy a product because they prefer it. The question is why consumers exhibit the preferences they do. The assumption that people have fixed, well-articulated preferences does not accurately predict people's decision making (e.g., Russo, Medvec & Meloy, 1996; Simon & Holyoak, 1999)—people's preferences are not fixed but relative (Kahneman & Tversky, 1979). In order for preferences to be relative, there must be some implicit or explicit comparison among items. A pioneering business writer, Mary Parker Follet, made a compelling case in the 1920s that people construct

preferences by drawing comparisons (Follet, 1995, p. 75): “we do not stop to examine a desire until another is disputing right of way with it... Revaluation is the flower of comparison.” There is now consensus that people's ability to make comparisons plays a crucial role in the processes they use to make choices (e.g., Medin, Goldstone, & Markman, 1995; Payne, Bettman, & Johnson, 1993). Over the past 30 years, there has been significant theoretical and empirical development in our understanding of the way that comparisons are processed. As a result, we now have a greater ability to predict consumers' choices.

Supporting the idea that comparison is closely involved in choice, research has found that comparisons play a role in many aspects of consumer behavior. Most obviously, consumers

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compare options when deciding among multiple available products of the same type (e.g., Houston, Sherman, & Baker, 1989) (Hsee, 1996). Consumers also process comparisons presented in advertisements. Some advertisements invoke comparison because they contrast products (Snyder, 1992). Other advertisements invoke comparison as a means to explain new products, taking advantage of analogies to known products (e.g., J Gregan-Paxton & Roedder John, 1997). Still, in much of the research on consumer behavior and choice more generally, the nature of the comparison process is not specified. Instead, predictions for the influence of comparison on consumer choice are drawn from general principles.

In this paper, we start by summarizing a more specific theory of comparison—the structural alignment model (Gentner & Markman, 1997). Then, we review research on comparison among options, comparative advertising, and analogy in product communication. We demonstrate that much of this work is compatible with the structural alignment model, and that there is value to its more precise predictions. Finally, we discuss ways to address more specific questions about consumer behavior by embedding research within a specific model of comparison.

Structural alignment and comparison

Any theory of comparison has to make assumptions about how people represent information, and has to specify a process for relating pairs of representations to assess their commonalities and differences (Markman, 1999). A classic early model of comparison was Tversky's (1977) contrast model. Because this model is an important precursor to the structural alignment model (and figures prominently in research on choice), we discuss it in some detail. This model assumed that people represent objects (such as the options in a choice setting) as sets of features, with each feature describing one property of an object. The contrast model then specifies that the comparison process is a matter of performing elementary set operations on the sets of features. The intersection of two feature sets is the set of commonalities between the items. The set differences are the distinctive features between the two items. The contrast model predicts that the similarity of two objects increases as the number of commonalities increases and as the number of distinctive features decreases. For cognitive processes that require attending to the commonalities and differences, the content of the sets of common and distinctive features can be used for further processing.

The structural alignment model of comparison began as a model of analogical reasoning and was gradually extended to more mundane comparisons (Gentner, 1983; Gentner & Markman, 1997). Initially, the model was designed to explain how people make analogical comparisons and how they transfer information from one domain of knowledge to another. The structural alignment model makes different claims than the contrast model about how people represent knowledge and about how the comparison process works.

According to structural alignment, objects are represented using structured hierarchical representations like the ones in

Fig. 1. These representations consist of *entities*, which are the basic components of the representation. In the top part of Fig. 1, the camera, scene, and computer are entities. Entities are described by properties called *attributes*. In this example, the camera is described by the attribute “lightweight.” Obviously, most entities are described by a large number of attributes. Critically, representations also contain explicit *relations* between elements that specify the ways that two or more entities, or other relations, are linked to each other. The items linked by a relation are called *arguments*. For example, by convention, we would write the left-most relation in top part of Fig. 1 as *capture(camera, scene)*, where “camera” is the first argument of the relation “capture.” Generically, we can use variables to denote the arguments, writing this relation as *capture(x,y)*. Relations are particularly important for representing information about causal and functional knowledge.

In analogy, relations are central. Pairs that are analogous share a common set of relations, even though those relations apply to different arguments. This makes the pairs dissimilar on the surface. For example, a digital camera and a scanner do not look alike. They are not used for the same purposes most of the time. However, they play analogous roles. Both devices capture images that can be transferred to a computer and processed later. The ability to represent and find commonalities on the basis of relations lies at the heart of structural alignment.

There are a number of computational accounts that specify algorithms that compare pairs of relational structures (e.g., Falkenhainer, Forbus, & Gentner, 1989; Hummel & Holyoak, 1997). The details of these processes are not crucial for the present discussion, but some general properties of this process are important (Gentner, 1983). First, comparisons are asymmetric. There is a *base* domain that is typically the one you know most about, and a *target* domain, which is one that you seek to learn about by analogy. When knowledge of one domain is extended based on knowledge of the other domain, these inferences are drawn from the base to the target.

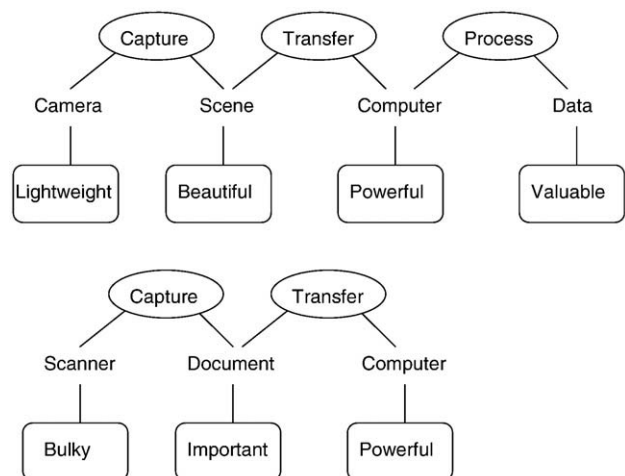


Fig. 1. Sample structured representations of two domains used to illustrate the relations, objects, and attributes that the structural alignment view argues are central to mental representation.

According to structural alignment, the comparison process highlights the relations common to the representations of each object. When common relations are found, the process aims to match the arguments to those relations as well. For example, in the comparison of the scanner and the digital camera (shown in Fig. 1), matching the “capture(x,y)” relations in each representation leads the “scene” in the top to be matched to the “document” in the bottom because both are the second arguments to the “capture” relation. Thus, even though the scene and the document do not look the same, they play the same role in each situation, and so they correspond.

The structural alignment model’s comparison process also supports finding the commonalities and differences of pairs of objects. The commonalities are straightforward. The elements of the two representations that correspond are the commonalities. The detection of commonalities can also lead to the detection of differences. For example, matching the “capture(x,y)” relation in the two domains in Fig. 1 leads to the recognition that cameras capture scenes, while scanners capture documents. Scenes and documents are noticed as a difference because they each play the same role within their respective representations. That is, they are noticed as differences because of the commonalities observed. These differences that are rooted in the similarities of a pair are called *alignable differences* (Gentner & Markman, 1997; Markman & Gentner, 1993).

Alignable differences are contrasted with *nonalignable differences*, which are elements in one representation that have no correspondence in the other representation. For example, the top representation has the relation “process (computer, data),” which has no equivalent relation in the bottom representation. Thus, this representational element is a nonalignable difference.

Much research on the comparison process suggests that commonalities and alignable differences are more important outputs of comparisons than are nonalignable differences. For example, commonalities and alignable differences get more weight in judgments of similarity than do nonalignable differences (Markman & Gentner, 1993, 1996). People also find alignable differences easier to list than nonalignable differences (Gentner & Gunn, 2001; Gentner & Markman, 1994).

Analogies are also powerful because they allow knowledge from one domain to be carried over to a second domain through a process called *analogical inference*. As a result of a base domain and a target domain being structurally aligned, people can identify nonalignable differences from the base domain that are consistent with the information in the target domain. These nonalignable differences can be proposed as being true in the target domain (Gentner, 1983; Holyoak, Novick, & Melz, 1994; Markman, 1997). For example, the idea that the computer processes data (in the base representation at the top of Fig. 1) might lead to the proposal that the computer (in the target representation at the bottom of Fig. 1) also processes data. Therefore, the structural alignment model of comparison, unlike Tversky’s contrast model, provides a basis for making predictions about specific inferences people will make as a result of drawing comparisons. Further, in addition to conveying knowledge from the base representation to the target represen-

tion, analogical inference also seems to convey emotions from bases to targets (Blanchette & Dunbar, 2001). This is a relatively unstudied process, and it is an opportunity for research on consumer behavior to play a leading role in advancing our understanding of comparison processes.

To summarize, early work on comparison established that items being compared had identifiable features, that there is a directionality to comparisons, and that pairs of items can have common and distinctive features (Tversky, 1977). The structural alignment approach to comparison (Gentner, 1983; Gentner & Markman, 1997) adds several key insights, including that relationships among features are key, that people draw predictable inferences from base items to target items, and that distinctive features can be either alignable or nonalignable. All of these factors influence consumer behavior.

Comparison of options in choices

Research in consumer choice has focused broadly on two influences of comparisons on choice. The first looks at the ways that the unique properties of options influence decisions. This work was inspired by Tversky’s (1977) feature-based contrast model of similarity (described earlier), though the results also bear on the role of structural comparisons in consumer decisions. The second line of research explores the relative influence of alignable and nonalignable differences in a variety of choice settings. We review each of these lines of research in this section.

Common and distinctive features in choice

Initial research on the role of comparison in choice focused on the relative influence of common and distinctive features in decision making (Houston, Sherman, & Baker, 1989, 1991). Comparisons help to determine the commonalities of a pair of options as well as the features that are distinctive to each option. The distinctive properties are the ones that have the most significant influence on choice because the common features are true of both options. Further, there is often a bias as to which distinctive features matter most. Research suggests that comparisons during choice tend to have one item that acts as a reference point for the choice. People’s attention tends to be drawn to the base referent, granting its features particular weight.

Houston et al., (1989) varied the order that people learned a pair of brands and also varied whether the distinctive features of the brands were positive or negative. They reasoned that the second brand would form the reference point for the comparison. There was a general tendency for people to prefer the second brand they saw, regardless of whether its distinctive features were positive or negative because it had been seen most recently. However, this tendency was strongest when the distinctive features of the brands were positive. In this case, people’s focus of attention led them to give great weight to the positive features of the referent brand. This tendency was significantly reduced when the distinctive features were negative, suggesting that the poor unique properties of the referent brand tended to drive people toward the alternative.

A follow-up study by these authors found that the nature of the distinctive features also influenced the ease with which the decision could be made as well as people's satisfaction with that choice (Houston et al., 1991). Choices in which the options had distinctive features that were good were easier to make than choices in which the options had distinctive features that were bad. This finding reflected that when people focused on a referent brand and that brand had good features, it was easy for people to decide to select that brand. In contrast, when the options had distinctive negative features, the referent brand would seem undesirable, leading people to shift attention to the alternative brand. That brand would also seem undesirable, and so the choice was difficult and time-consuming.

With choice satisfaction, the pattern was more complex. If the options had distinctive features that were good, then people were more satisfied with their choice when they focused on the option they selected than when they focused on the option they rejected. Focusing on the rejected option led them to think about the positive features that were foregone. If the options had distinctive features that were bad, then they were more satisfied with their choice when they focused on the option they rejected than when they focused on the option that they selected. In this case, focusing on the selected option led them to regret the bad options that they were ultimately forced to choose.

The relative emphasis on the common or the distinctive features of the options can also be changed by contextual factors. For example, Dhar, Nowlis, and Sherman (1999) had people compare options prior to making a choice and had people list either the commonalities of the pair of options or the differences. Straightforwardly, focusing on the commonalities of a pair increased the importance of those commonalities in the subsequent choice, while focusing on the differences increased the importance of the differences between the options. This finding is interesting because increased attention to the common features meant that after people expressed a preference for a particular brand, that preference became stronger when the option had positive common features, even though those common features were true of both options.

People are also sensitive to relationships among the features. Kardes and Sanbonmatsu (1993) looked at cases in which people could reasonably assume that the presence of some features signaled the existence of others. For example, when shopping for cars, people believe that a car's fuel economy, steering and transmission affect its overall performance and handling. They found that effects of the direction of comparison were eliminated when people could infer the presence of missing features based on the shared properties of the objects.

Factors that decrease the likelihood of making a comparison reduce the effect of distinctive features on choices. Payne et al., (1993) made a general distinction between choice processes that promote attribute-based processing—in which the options are compared and values along different attributes are matched—and alternative-based processing—in which each option is evaluated independently. Mantel and Kardes (1999) looked at a variety of factors that could influence people's likelihood of comparing attributes of options. They found that high levels of Need for Cognition (Cacioppo, Petty, & Kao,

1984) and high levels of involvement in the choice (Petty & Cacioppo, 1986) tended to lead people to compare the options. These participants were more strongly influenced by the distinctive features of the options and to display the direction of comparison effects described earlier than were participants low in Need for Cognition and Involvement.

To summarize, research inspired by featural models of comparison suggests that people focus primarily on the distinctive properties of items when they compare options. Furthermore, they tend to hold one item as the focus of attention and use it as a reference point. The distinctive properties of that referent item are generally more influential in the choice than are the properties of the alternate option. The factors that influence preference also influence satisfaction with the choice later. Finally, a variety of contextual and personality factors can influence the degree to which people focus on commonalities rather than differences.

Structural comparison and choice

The research described in the previous section was inspired primarily by featural models of comparison. The research based on featural models is quite important, but it does not take advantage of the finer-grained predictions that can be derived from the structural alignment model. We turn to this research in this section.

There has been quite a bit of work on choice that incorporates elements of the structural alignment model. For example, a key prediction of the structural alignment model of comparison that goes beyond the predictions of featural models is that the properties of objects need not be considered independently. Because features are linked by relations, features that are different can nonetheless be related to one another because they alignable. As a result, a feature of one item can bring to mind a specific, contrasting feature in another item. Perhaps the most central prediction of the structural alignment model of comparison is that a comparison of options should focus people on the alignable differences of options (i.e., those properties for which there are contrasting values for each option) rather than the nonalignable differences (i.e., those properties of one option for which there is no corresponding value in the other option). Thus, in the context of comparisons, people should place greater weight on alignable differences than on nonalignable differences.

An early finding consistent with the importance of alignable differences in choice comes from research on dimensional commensurability. Slovic and MacPhillamy (1974) observed that when one option had a missing value along a dimension, that dimension did not play a significant role in determining people's choices. That is, alignable differences between options appear to play a greater role in choice than nonalignable differences. Kivetz and Simonson (2000) varied the dimensions that were alignable across options in order to induce inconsistencies in preferences across a set of choices. Because people would focus primarily on the alignable difference, they were able to create cases in which option A was selected over option B in a pairwise choice (based on the dimensions alignable in that comparison),

but option B was selected over option C (based on a different set of alignable dimensions, and finally option C was selected over option A, creating an intransitivity.

Another finding that is consistent with this proposal comes from research inspired by the feature comparison research described in the previous section. Sanbonmatsu, Kardes, and Gibson (1991) contrasted pairs of options that differed in unique properties (nonalignable differences) that are usually used in studies inspired by Tversky's contrast model with options that had different values along a common dimension (alignable differences). They found that the asymmetries between referent and alternative brands that are typically observed in studies like this are eliminated when the brands differ by alignable differences. This finding suggests that focusing on an alignable difference of one option naturally leads consumers to think about the corresponding values of other options. This effect is predictable from a structural alignment approach to comparison but not an independent features model of comparison, showing the value of drawing on this model of comparison for understanding consumer choice.

Another test of the role of structural comparison in choice explored the degree to which people's justifications of choices involved alignable differences (Markman & Medin, 1995). In these studies, participants chose between pairs of video games described in paragraphs, and then wrote out a justification for their choices. Some of the properties were unique to one of the games, and so were nonalignable differences. The other properties were alignable differences, defined as elements of one game that had contrasting elements in the other game. People's justifications contained reliably more alignable differences than nonalignable differences. Similarly, Nowlis and Simonson (1997) found that alignable differences were more important to people's choices than were nonalignable differences.

Comparisons can guide choice even if people are only presented a single item at a time because people can compare a current item to items learned previously. Defaults (Brown & Krishna, 2004) and the status quo (Carmon & Ariely, 2000) can act as a base against which to compare a choice. The most detailed work on comparison across time though has occurred in the context of the well-known order-of-entry effects in brand learning: early market leaders tend to remain the market leaders in a product category (Golder & Tellis, 1993). Zhang and Markman (1998) simulated order-of-entry effects by teaching participants about brands over a series of sessions, each a few days apart. The first brand was presented alone. In a subsequent session, two additional brands were presented. These brands were set up so that they had some commonalities with the first brand and some differences (that were either alignable or nonalignable differences). Furthermore, one of the brands presented late was objectively superior to the brand learned first.

In a final experimental session, participants had to express their preferences to the brands by allocating 100 points to the brands in proportion to their preferences. They were also asked to remember as many of the properties of the brands as possible. When the brands differed by nonalignable differences, people

showed a reliable preference for the first brand, and they recalled more unique properties of the first brand than of later brands. In contrast, when the brands differed by alignable differences, people showed a reliable preference for the objectively superior brand and were also able to recall differences for all three brands that they had seen. Subsequent studies have demonstrated that having alignable differences can also allow brand extensions to compete successfully with products learned earlier (Oakley, Duhachek, Balachander, & Sriram, 2008). This is a case of the advantages of using the more sophisticated, structural alignment approach to comparison, as it provided a basis for analyzing order of entry effects and why initial entrants can be more and less enduring.

Zhang and Fitzsimons (1999) extended these findings to look at choice satisfaction. They find that people are generally more satisfied with choices when the options differ by alignable differences than when they differ by nonalignable differences. However, when the choice set is decreased in scope by removing an option, then choice satisfaction decreases more when the options differ by alignable differences than when they differed by nonalignable differences. That is, ease of alignment can increase the regret people feel for the options foregone.

Studies have also expanded the range of alignability to include the comparison between a target product and potential add-ons to that product (Bertini, Ofek, & Ariely, 2009). An add-on is an extra feature, benefit, or device that one can purchase in addition to a target product. For example, when buying a computer, one could purchase a memory upgrade to increase the RAM of the computer, or a separate DVD drive to allow data to be taken from DVDs. The first of these add-ons is an example of an alignable add-on because it extends a dimension that the base product already has. The second add-on is nonalignable because it extends the range of product dimensions. Bertini et al. found that alignable add-ons often decreased people's overall evaluation of the base product because these attributes make clear to consumers that the product could have been even better. In contrast, nonalignable add-ons that are positive properties increase people's overall evaluation of the base product. The nonalignable add-on does not highlight a shortcoming of the base-product. Instead, nonalignable add-ons might indicate positive but latent functionality in the base product. Or, positive characteristics of the add-on might increase evaluations by association, if people misattribute the positive evaluation of the add-on to a positive evaluation of the product overall (Dutton & Aron, 1974).

A similar finding was obtained in research on what consumers look for when thinking about upgrading a product they currently own (Okada, 2006). When consumers already own a product in a class (say a particular smart phone), they may value the opportunity to get features that they do not already have rather than paying additional money to enhance features that are already part of the product they own. Consistent with this hypothesis, Okada (2006) found that consumers who already own a product are more willing to pay for new products that differ from their existing product by nonalignable differences than by alignable differences.

The distinction between alignable and nonalignable differences also affects people's perception of the variability in a choice set. [Gourville and Soman \(2005\)](#) examined two ways that brands might increase the amount of variability within a choice set. Alignable variability is achieved when a brand comes out with varieties that contain different values along a common dimension. For example, a brand of microwave ovens might have variants that differ in their interior capacity. Nonalignable variability occurs when each variant has a distinct feature not possessed by other brands. This research suggests that when the variability is alignable, consumers are able to manage the tradeoff between price and features, and feel satisfied with their choice. When the variability is nonalignable, consumers feel that there are too many features that they might have to do without, and so they find it difficult to make a choice and are not satisfied with the choices they make. Thus, brands that add nonalignable variability may actually drive consumers away from their brand.

[Hermann and colleagues \(2009\)](#) extended this work in a few interesting ways. First, they demonstrated that seemingly nonalignable attributes can be made to appear alignable if they are given labels that are alignable (e.g., basic, premium, luxury). Second, they found that the greater the proportion of features that were made alignable, the faster consumers made choices. In addition, people were willing to pay more for products as the proportion of alignable attributes increased. Thus, marketers looking for ways to present variety to consumers within their brand should focus on making the set of attributes that describe their offerings alignable.

Another example of the bias toward alignable differences comes from research on memory for choice options. [Mather, Knight, and McCaffrey \(2005\)](#) looked at memory for both alignable and nonalignable differences over delays of a day and a week. In studies with recall, they replicated the finding of [Zhang and Markman \(1998\)](#) described earlier that alignable differences are more likely to be recalled than nonalignable differences. Of particular interest, though, over time both young adults and older adults tended to mis-remember the features for a pair of items in ways that made the features more alignable. For example, sometimes when people recalled a feature of one item that was initially a nonalignable difference, they generated a corresponding alignable difference for the other item. They created alignable differences for about a quarter of the nonalignable features they recalled after a one-day delay, and about half of the nonalignable features they recalled after a one week delay. Thus, in memory, options became more alignable over time.

There are some moderating influences on the importance of alignable differences in choice. The claim from a structural alignment approach to comparison is that alignable differences should attract attention because they are related to the commonalities between items, whereas nonalignable differences should get less attention. However, people can compensate for the biasing tendencies of what the comparison process emphasizes and deemphasizes. For example, [Zhang and Markman \(2001\)](#) found that consumers with high levels of

task involvement were more likely to use the nonalignable differences of options than those with low levels of involvement. This high degree of involvement allowed consumers to find brands that were superior on the basis of their nonalignable differences.¹

The time horizon of the choices is a second moderating influence. [Malkoc, Zauberan, and Ulu \(2005\)](#) examined the influence of temporal construal on choice. Construal-level theory argues that people tend to interpret information more abstractly when it is distant in space or time than when it is near in space or time ([Trope & Liberman, 2003](#)). This abstraction may also allow people to consider properties that do not emerge easily from comparisons of options. Consistent with this possibility, Malkoc et al. had participants make choices of pairs of options that they would receive either at the end of the experimental session or at the end of the semester. Participants gave greater weight to alignable differences than to nonalignable differences in choices for right now. In contrast, they gave greater weight to the nonalignable differences than to the alignable differences in choices made for the end of the semester. There is some evidence that people can think more and less abstractly about product features, and in so doing shift their use of alternative- and attribute-based processing ([Johnson, 1984, 1988](#)).

The studies summarized in this section provide broad support for the prediction of structural alignment that alignable differences play an important role in choice. Alignable differences are more likely than nonalignable differences to be used in justifications, to be recalled in choices, to influence choices, and to play a positive role in the perception of brand variety. In memory, nonalignable differences tend to be turned into alignable differences, as people falsely recall additional, contrasting properties. Nonalignable properties do play a positive role in add-ons. Alignable add-ons influence people's representation of a product, and so they decrease people's satisfaction with the options they are given, while nonalignable add-ons give people a sense of possibility for extending functionality. Finally, studies suggest that increasing involvement with a decision and increasing the temporal distance to the choice outcome can increase the use of nonalignable differences in choice, presumably because these factors increase people's attention beyond the focus of what the comparison highlights.

¹ There is a potential inconsistency between the results of the studies by [Zhang and Markman \(2001\)](#), and those of [Mantel and Kardes \(1999\)](#). Mantel and Kardes argue that high involvement increases reliance on comparison-based processes. This reliance on comparison could potentially lead to a greater reliance on alignable differences, rather than the lower reliance observed by Zhang and Markman. One possibility is that the simultaneous presentation of the items in the study by Zhang and Markman allowed high-involvement participants to focus attention on the nonalignable differences. This is an interesting potential avenue for future research. Of course, when choices are made from memory (as in [Mantel and Kardes, 1999](#)), low involvement may make it difficult for people to remember the features of the options. Comparisons cannot be made when people do not know enough of the properties describing each option.

Comparative and competitive advertising

Advertisers use both comparative and competitive advertising to provide consumers with information about products. In competitive advertising, each ad focuses on a single product, and ads for different brands can be compared by consumers. An ad for Chevy trucks with a picture of a truck and copy about the brand would be a competitive advertisement. In comparative advertising, advertisers compare two or more brands within the same ad so that a focal product is contrasted with alternatives (Snyder, 1992). In a comparative advertisement, the focal brand is explicitly compared to one or more competing brands. For example, an ad that contrasts the features of Chevy trucks with those of Ford trucks would be a comparative ad.

One study in a competitive advertising context has examined the role of alignable and nonalignable differences in ads (Lee & Lee, 2007). This work replicates the findings described earlier on brand learning and alignability. People are better able to process and recall information about brands when the competitive ads describe the brands by highlighting alignable differences of the options than describe the brands by highlighting nonalignable differences. Of particular practical importance, consumers' ability to recall nonalignable differences decreased sharply as the number of competing ads increased. Thus, alignment does an excellent job of protecting people from information overload when learning about crowded markets.

Johar and Roggeveen (2007) examined the role of ease of alignment on the effectiveness of competitive advertising that aims to refute a claim made in a previous ad. In these studies, participants were first exposed to ads that made a claim either directly ("Avis offers accident insurance") or indirectly ("All car companies offer accident insurance; Avis is a car company."). After exposure to these ads, participants saw an ad refuting that claim ("Avis does *not* offer accident insurance."). At the time that the refutation is presented, the refutation itself is judged to be more truthful if it responds to an implied claim than to a direct claim. Of interest, though, the refutation had the biggest impact at refuting the initial claim when it was directly alignable to an explicit claim made in a prior ad. This finding may reflect that the alignable claim helps to call to mind the fact that it is refuting.

In addition to its role in competitive advertising, structural alignment is also useful for understanding comparative advertising. Zhang, Kardes, and Cronley (2002) examined three kinds of comparative ads. Comparative ads with alignable differences compared a focal product to a competitor along a common attribute. The other two kinds of ads involved nonalignable differences. In one, the focal brand was described with a property that the competitor did not have. In a second, one property of the focal brand and the competitor were given but these properties did not correspond. Comparative ads with alignable differences were most effective. The next most effective were ads that described a property of the focal brand with no corresponding property in the competitor. The least effective ads were those that gave a

property of the focal brand compared to a nonalignable property of the competitor.

Much research on comparative advertising examines structural comparison in more indirect ways. For example, Priester, Godek, Nayakankuppum, and Park (2004) manipulated ease of comparison of the brands by manipulating the familiarity of the brands compared. In the high familiarity condition, one common brand (e.g., Crest) was compared to a second common brand (e.g., Colgate). In the mixed condition, a common brand was compared to an unfamiliar brand (e.g., Zact). For high familiarity ads from a common product category, people have little difficulty comparing them, and so consumers do not put in much effort to process them. In contrast, for mixed familiarity ads, people have more difficulty comparing the brands, and so they must put in more effort to process the ad message. Consequently, people are better able to identify ads that make weak arguments in favor of the focal brand when the comparison is of mixed familiarity than when it is of high familiarity.

One important way that comparative advertising differs from the comparison of options during choice is that ads create affective responses in consumers that ultimately influence product choice. For example, Jain and Posavec (2004) examined two kinds of comparative ads. Positive ads are ones in which the ad states positive features of both the focal and alternative brand, but the focal brand is better. Negative ads are ones in which the focal brand is deemed better than the alternative because the alternative brand has a negative property. Participants strongly preferred the positive ads to the negative ads. Importantly, one reason they preferred these positive ads was because they generated more positive affect than did the negative ads. In the ads used in this study, the comparison was made along an alignable dimension. It is an open question as to whether the influence of positive affect would be maintained if the positive and negative properties were nonalignable. Comparative advertising provides a context for doing research that extends work on structural alignment by focusing both on the information people use as well as the affective information that comparisons can help to create.

To summarize, research on advertising is consistent with the research on comparison in choice described earlier. Ads that highlight alignable differences between products (either within an ad or between ads) are better remembered by consumers later and are thus generally more effective. Ads that aim to refute claims by competitors are also more effective when they focus on alignable differences rather than nonalignable differences. Research on advertising also extends studies of structural alignment by incorporating people's affective responses to ads. Few studies have addressed the ways that comparisons support the generation and transfer of affect, so this work expands on our knowledge of the influence of comparisons on choice. Taken together, these studies on advertising, and the earlier studies on choice, show that people make use of comparison in their evaluations of options, and that a structural alignment approach to comparison is useful for predicting an array of outcomes.

Using comparisons to communicate

In analyzing the role of comparison in choice and advertising, there was a particular emphasis on differences because commonalities do not distinguish among alternatives. However, there is a key role for commonalities to play in consumer behavior. This is the use of comparison not between items one needs to choose between, but to communicate about or frame a particular item. There are only a few routes to teach consumers about new products or to teach them new things about known products. The most straightforward route is to provide information about the product directly within the domain of that product. For example, many drug ads talk to consumers about the benefits (and side-effects) of the medication directly within the medical domain that the product is expected to work. The consumer behavior literature has recognized a second route by which consumers learn about products, which is that they use analogies (Gregan-Paxton & Roedder-John (1997): consumers draw comparisons between items they already understand (base) and new products (target). The comparisons can be self-generated, but they are also frequently provided in advertising as a means for companies to communicate effectively to consumers (Goldenberg, Mazursky & Solomon, 1999; Phillips & McQuarrie, 2009).

For example, Roehm and Sternthal (2001) examined the influence of analogies on what people learn about new products. They used products like software packages, for which some knowledge about a domain is required to understand the base product used for the comparison. For example, computer novices might not know much about the Quicken software package. If they do not know much about this base product, then they will not gain much from learning that a new software package in another domain works like Quicken.

Consistent with this analysis, Roehm and Sternthal (2001) found that experts in an area were much more likely to develop a positive evaluation of a new brand based on an analogy than were novices. Indeed, the experts most strongly affected by an analogy were those that were high in Need for Cognition, and thus were likely to want to think through the comparison between the products. Novices were able to derive some benefit from the analogy, particularly when the context strongly encouraged them to think expansively about the comparison. For example, a manipulation of positive affect, which is known to enhance creative thinking (Isen, 2001), increased novices' processing of the comparison between the analogies and the new products.

To enable consumers to understand very new products, marketers can select examples that are already well-known by most people to use as analogies. For example, Moreau, Markman, and Lehman (2001) looked at the way that a new product (digital cameras when they were first introduced) could be learned by analogy to either film-based cameras or scanners. Both of these base domains were reasonably well-known to participants.

The comparison product given had a broad set of influences on the way people thought about the new product. For example, comparing a digital camera to a scanner led people to expect to

find the product in the computer section of a store, to expect that the picture quality would be relatively poor, and to be relatively uninterested in considering a purchase of a digital camera. In contrast, comparing a digital camera to a film-based camera lets people to expect to find the product in the camera section of a store, to believe that the camera would take high-quality images, and to be relatively more interested in considering a purchase of a digital camera.

One interesting observation is that framing a marketing communication as an analogy (e.g., a digital camera is like a scanner for the world) differs from framing that marketing communication as a categorization (e.g., a digital camera is a scanner for the world). Gregan-Paxton and Moreau (2003) observed that people were more likely to transfer surface details of a product when the communication was framed as a categorization than when it was framed as an analogy. In addition, alignable differences were relatively better recalled than nonalignable differences when the communication was framed as an analogy than when it was framed as a categorization. These results are consistent with the observation that analogies may act like x-rays: they allow people to look past surface details and instead focus on the shared relational structure of a pair of items (Gentner et al., 1997).

In the discussion of comparative advertising, we discussed that comparisons can create emotions that influence choices. Research on the role of analogy in communication extends this point. For example, Blanchette and Dunbar (2001) examined the use of analogy in Canadian newspapers during the debate about the possibility of separating Quebec from the rest of the country. An important element of these analogies was their emotional tone. Some analogies were drawn to make separation appear positive (e.g., Quebecois want to build their own home). Others were drawn to make separation appear negative (e.g., It's like parents getting a divorce). In each case, the expectation was that the analogy would transfer not only information from one domain to another, but also an overall emotional tone from one domain to another.

Thagard and Shelley (2001) point out another influence that emotion can have on communicative analogies. The processing of an analogy may generate an emotion that may in turn be transferred to the target product. For example, they point to an advertising campaign to get people to pay attention to the security of their computer passwords by drawing a link between passwords and underwear. Like underwear, passwords should be kept private and changed often. Presumably the comparison itself is humorous. This humor can generate attention to the ad, can help it be better recalled, and can transfer positive affect to the target domain. Thagard and Shelley (2001) provide a number of nice examples of this phenomenon, though they do not do any empirical studies of the role of emotion on analogy.

In the context of consumer choice, Goode, Dahl, and Moreau (in press) looked at analogies that were specifically designed to convey emotions by tying them to analogous experiences with emotional content. For example, a ride in a car might be compared to a first kiss, to communicate the feeling of exhilaration associated with driving the car. Ads with experiential analogies were more persuasive than ads that provided a literal description

of the emotional state. The analogy is effective because it allows the consumer to generate the emotion based on a previous experience and then apply it to the current situation.

This paper also rules out an important alternative explanation for the findings. One possibility is that a base domain (e.g., a first kiss) just activates an emotion, and then that emotion becomes associated with the target product. Goode et al. (in press) varied the goodness of the analogies in one study, holding constant the emotion generated by the analogy. Analogies that people felt were particularly apt were more persuasive than analogies that were judged to be less apt. Thus, the transfer of the emotion from base to target seems to involve more than just activating the emotion with the base domain.

To summarize, analogies are an excellent method for communicating information about new products. They are most effective when knowledge from a well-known base domain is transferred to a novel target domain. Analogies may be difficult when the base domain is not well understood or when consumers are not motivated to exert effort to process the analogy. Analogies may also provide emotional information about the target product. This emotional transfer may occur either because the base domain has an emotional tone that is transferred to the target, or because emotion is generated in the processing of the analogy itself.

Future directions

So far, we summarized research on the role of comparison in choice. In a previous paper, Medin et al., (1995) looked at parallels between research on similarity comparison and research on choice and suggested that judgment processes involved in similarity might have implications for research on decision making. In the present paper, we have traced an evolution of research on comparison processes in choice. The work that emphasized effects of the direction of comparison on people's decisions was generally inspired by Tversky's (1977) contrast model of similarity. This work focused on the particular features of options rather than on the relationships among features within an option. Some of this research did acknowledge that there are statistical correlations among features, but the feature-based framework has no mechanisms for representing the relations among features explicitly.

We then turned to research inspired by the structural alignment model of comparison (Gentner, 1983; Gentner & Markman, 1997; Hummel & Holyoak, 1997). Structural alignment goes beyond feature comparison models by assuming representations that contain explicit information about the relations among properties of options. Much of the work inspired by structural alignment has focused on the distinction between alignable and nonalignable differences. Alignable differences typically play a more significant role in choices than do nonalignable differences. This difference emerges both in brand learning and also in comparative advertising.

Other elements of the structural alignment approach are less well-studied in choice. These aspects provide a basis for future research. One element of structural alignment that has not been the source of much work in choice is analogical inference.

Research on analogical inference is a way to merge research inspired by the featural approach with structural alignment. Studies inspired by the feature comparison model focused on effects of the direction of comparison on choice.

We know from the work on using analogies to communicate about new products that people can derive knowledge about a target product from knowledge about base products (e.g., J. Gregan-Paxton & Moreau, 2003; Moreau et al., 2001). These inferences are known to be strongly directional (Markman, 1997). Information goes from the base domain to the target domain. Thus, analogical inference is another mechanism that might create asymmetries in choice depending on which option is considered to be the referent.

In addition, theories of analogy make more specific predictions about the kinds of information that will be carried from base to target (e.g., Falkenhainer, et al., 1989; Holyoak et al., 1994; Markman, 1997). Inferences are only made when there is some matching fact between two domains, and in the base domain that matching fact is connected by relations to a unique piece of information that is not known to be true in the target. Only when inferences are licensed in this way are they proposed (Markman, 1997). Research on text comprehension suggests that these inferences may influence the way people understand new situations (Day & Gentner, 2007). Indeed, these inferences may later be mis-remembered to be true of the target domain, even though they were never stated explicitly as part of that domain.

This inference process is fertile ground for further research on choice. For example, analogical inferences may help turn nonalignable differences into alignable differences. If there is a relation that connects a matching feature between two options to a nonalignable difference, then this unique property is a good candidate for an inference from one option to another. This work would extend Kardes and Sanbonmatsu's (1993) from correlations among features to cases in which features are connected via relations.

Furthermore, analogical inferences that are strongly supported by the base domain may become part of people's representation of the target domain, so that people may not recognize which facts about options were stated explicitly, and which were generated as inferences. Thus, people's expectations about new products can be biased systematically by the nature of the analogical inferences that are made.

The use of comparison in communicating about new products is also still new. Research has examined direct comparisons, metaphors, and analogies between a familiar base and a target product. Another use of comparison in communicating is less direct. This is the use of comparison over similar items to establish an expectation for consumers that can then be violated by the introduction of the new product, generating surprise and interest. This kind of pattern appears in music, jokes, folktales and myths (Loewenstein & Heath, 2009; Rozin, Rozin, Appel & Wachtel, 2006). It also seems to appear frequently in advertising, such as in Mastercard's Priceless campaign: "18-speed bike: \$1,235. Shipping bike to Italy: \$281. Map of Tuscany: 4,000 lira. Seven days without e-mail: priceless." The broader suggestion is that comparison is a sufficiently powerful

guide to attention and understanding that there are myriad ways in which it is used to communicate to consumers.

Social comparisons are another source of influence in consumer choice (e.g., Ariely & Levav, 2000; Bearden & Rose, 1990). Furthermore, research on social comparison suggests that we react to new situations based on the degree to which the people in those situations remind us of significant others in our lives (e.g., Chen & Andersen, 1999). As a structural alignment approach to comparison enters into research on social comparison (Mussweiler & Gentner, 2007), so too could we expect to advance our understandings of the role of social comparison in choice. Research on social comparison often relies on surface properties, such as a single demographic dimension, as a basis for comparison. However, if people can also compare others on the basis of role-based commonalities and alignable differences, this opens up new avenues for social influence on choice.

A particularly interesting kind of social comparison may involve the comparison between a person's current self and their future self. Ads often try to activate goals for people by getting them to envision how their life might be if they made a particular purchase or engaged in a particular experience. One intriguing possibility is that analogical inferences may be useful for helping to generate these beliefs about a future self. That is, creating a set of relations that connect to matching features between a person's current and future self might ease the process of goal adoption.

Analogical reasoning is also deeply related to creativity (Hofstadter, 1995). Recently, creativity has also been linked to consumer behavior. Research in consumer behavior has become interested in the way that consumers construct creative experiences associated with a product and a purchase and how those experiences influence their satisfaction with products (Dahl & Moreau, 2007; Moreau & Herd, 2009). One possible method to affect consumers' satisfaction with products that they designing or customize is to use analogies to suggest possible designs. If companies provide a model for design, it might make consumers feel that their own design is derivative of another. In contrast, if companies made design suggestions by analogy, it would encourage consumers to draw the analogies themselves, and therefore might provide consumers with more of a sense of ownership of their final product.

Another important area for future research is emotion (Weber & Johnson, 2009). As we discussed, analogies can be used both to transfer emotions from one domain to another and also to generate emotions. Some research has begun to explore this issue, but more work is clearly warranted. This work must examine the methods by which analogies lead to emotional responses in the target. For example, analogy from a base domain might become associated to a target domain through processes of misattribution (Dutton & Aron, 1974) or through conditioning that occurs by pairing a stimulus with other items that have a positive affect (Jones, Fazio, & Olson, 2009; Olson & Fazio, 2001).

In addition, work must examine the interplay of strategies in choice. It is clear that comparisons often play a central role in decisions. However, there are clearly a variety of strategies that people can bring to bear on choices (Payne et al., 1993).

Furthermore, there is evidence that experts in a domain are far less likely to make comparisons among options during choice than are novices (Klein, 2000). Instead, experts tend to compare the current situation to familiar situations from the past. Ultimately, it is important to determine the circumstances under which analogy and structural similarity influence people's preferences and choices.

Analogy may also be important for helping people to develop strategies for making choices. Research on negotiation suggests that people may be able to use analogies to recognize new situations in which a past negotiation strategy might be employed (Loewenstein, Thompson, & Gentner, 1999). Similarly, analogies between a past decision setting and a new one may suggest strategies for making a new choice.

Finally, while there has been an explosion of research relating advances in similarity and analogical reasoning to choice, the area of analogy has seen less growth. A key reason why there has been less work on analogy is that most research within cognitive science has focused on predictions that can be made based on the structure of people's knowledge rather than the content of people's knowledge (Markman & Wood, 2009). The concern about focusing on content within cognitive science is that it may be difficult to separate out the contributions to performance of central aspects of the cognitive architecture from the role of idiosyncratic domain knowledge.

Embedding research on analogy within content domains like consumer behavior, then, is likely to feed new phenomena back to basic research on comparison. These new phenomena will help to rejuvenate research on analogy within cognitive science. Already, work on emotional transfer by analogy and research on social comparison is beginning to have this effect.

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