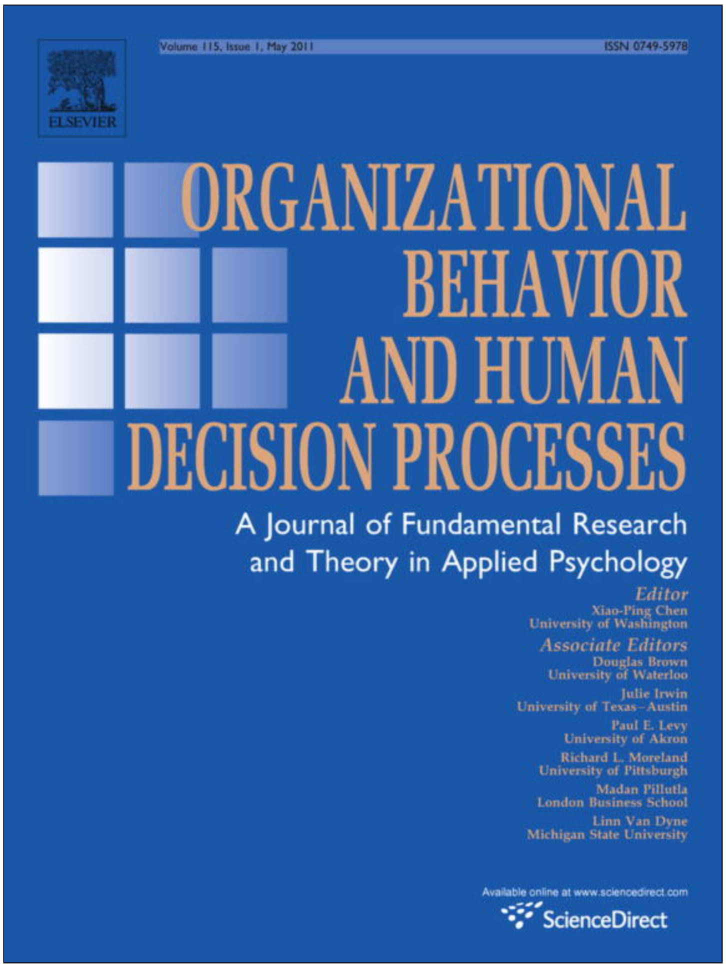
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Preference, projection, and packing: Support theory models of judgments of others' preferences

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ABSTRACT

People frequently need to predict the preferences of others. Such intuitive predictions often show social projection, in which one's own preference for an option increases its perceived popularity among others. We use support theory to model social projection in the prediction of preferences, and in particular interactions between social projection and description-dependence. Preferred options are predicted to have consistently high salience, and therefore should be less susceptible to description variations, such as unpacking, which normally affect option salience. This *preference salience* premise implies an interaction between social projection and option description, with reduced unpacking effects for hypotheses including preferred options, or equivalently, with reduced social projection when less-liked alternatives are unpacked. Support theory models accommodating different preference-dependent unpacking effects are tested. These models distinguish two substantial contributors to social projection effects: (a) greater evidence recruited for preferred options and (b) greater discounting of packed less-preferred options.

Introduction

The need to predict the preferences of others arises in many contexts. For example, within organizations, managers must accurately predict what motivates their employees in order to effectively reward their behavior. In other cases, managers may need to predict the reactions of their subordinates to managerial decisions in order to anticipate organizational responses that these decisions may induce. Employees may also need to predict what other people in the organization would consider as the acceptable course of action (Flynn & Wiltermuth, 2010). In negotiations, reaching mutually satisfactory outcomes may require accurately predicting the preferences of the other party (Bottom & Paese, 1997), especially in cases where parties strategically withhold such information. Failure to do so may result in unnecessary concessions or unreasonable demands, leading to sub-optimal outcomes. In strategic decisions involving uncertainty, choosing the right action may depend on correctly assessing the risk preferences of others, such as potential competitors (Faro & Rottenstreich, 2006).

In the absence of formal market research, marketers must also make intuitive assessments of the preferences of their customers. Marketers routinely predict product attributes and benefits that their target customers are likely to find attractive, and create and position their products or services in accordance with these predictions (Hoch, 1987, 1988). In specialized domains, professionals such as wine stewards, party planners, or interior decorators must predict the preferences of their customers (Solomon, 1986).

In the course of everyday experience, people also frequently make predictions about the preferences of others, either explicitly or implicitly. Tasks such as buying a birthday gift for a friend or choosing a surprise honeymoon destination require predicting the preference of another individual (West, 1996). In group decision making contexts, such as a group of friends deciding where to have dinner, judgments of the preferences of other group members will also affect decisions. Even in individual, private choices, beliefs about others' preferences will often be relevant. For example, in purchasing fashion-related or aesthetic items for themselves, people implicitly evaluate the popularity of potential options, in order to choose an item that they believe others will like or be impressed by (Bearden & Etzel, 1982; Childers & Rao, 1992).

Social projection and false consensus

One robust finding from social psychology is that people tend to project their own preferences onto their perceptions of others, such that predictions of others are positively correlated with one's own preference (Krueger & Clement, 1994; Marks & Miller, 1987; Ross, Greene, & House, 1977). Social projection of discrete preferences can be simply illustrated by comparing the predictions of

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the set of people with a particular preference to the predictions of those with another preference. For example, given a choice between coffee or tea, those who prefer coffee tend to judge the popularity of coffee as higher than those who prefer tea do. This empirical contrast has been termed the "false consensus effect" (Ross et al., 1977), although there is some dispute about the extent to which this discrepancy ought to be considered an error (see Dawes, 1989; Dawes & Mulford, 1996).

Past research has identified several factors that influence the degree of social projection. It has been shown, for instance, that a person's attributional focus (Gilovich, Jennings, & Jennings, 1983), the desire to be seen in the mainstream (Marks & Miller, 1987; Sherman, Presson, & Chassin, 1984), latitude of response alternatives to be differentially construed (Gilovich, 1990), social categorization (Clement & Krueger, 2002), perceived similarity to the target (Ames, 2004), and selective exposure (Sherman et al., 1984) can all affect the magnitude of social projection. The present study contributes to this literature by investigating the impact of the explicitness of the description of the choice options on social projection. We use support theory (Rottenstreich & Tversky, 1997; Tversky & Koehler, 1994) to model the predictions of others' preferences. Support theory supplies a flexible modeling framework for predictions of others that can be expressed in terms of probabilities ("There's an 80% chance that Paul will like this movie") or relative frequencies ("90% of people would prefer to visit Paris rather than Berlin"). In particular, as we demonstrate below, support theory models can incorporate the joint and interactive influences of (a) the judge's own preferences and (b) the potentially idiosyncratic description of the choice options on judgments of the preferences of others. A particular benefit of the support theory framework for modeling social projections is that it allows distinguishing the portion of social projection attributable to description or framing differences from the portion attributable to other combined cognitive or motivational factors.

Description-dependence and preference salience

Support theory was initially introduced to accommodate framing effects in probability judgment (Tversky & Koehler, 1994). Studies of framing effects in judgment and choice routinely illustrate description-dependence; formally equivalent situations may yield different judgments and choices depending on how the stimuli are described (Tversky & Kahneman, 1981, 1986). We examine a particular type of description variation, contrasting *packed* and *unpacked* descriptions of the same event. To illustrate, consider a judge expressing a preference among three options *A*, *B* and *C*, and then making a judgment of the popularity of various collections of options. Numerous studies (e.g., Koehler, Brenner, & Tversky, 1997; Menon, 1997; Russo & Kolzow, 1994; Tversky & Koehler, 1994; see Brenner, Koehler, and Rottenstreich (2002) for a review) have found that the judged probability or frequency of an explicit, unpacked description (such as "people prefer either item *B* or item *C*") to be systematically greater than the judged probability of its implicit, packed co-extensional counterpart ("people prefer something other than option *A*").

We propose that the attractiveness of a particular option will affect how much its perceived popularity will change between packed and unpacked descriptions. Our central premise, *preference salience*, is that the judge's most preferred option will tend to naturally be salient, irrespective of the idiosyncratic description of the set of options encountered in the judgment query. Assessments of less-preferred options, in contrast, will be more susceptible to these idiosyncratic description changes that make them more or less salient. If preferred options are indeed consistently salient, then an interaction should arise between the judge's own preference and the description of the possible options. Specifically, unpacking effects for hypotheses including preferred options should be weaker than unpacking effects for hypotheses including less-liked options. Equivalently, social projection should be reduced when less-liked alternatives are unpacked.

To illustrate the logic of the preference salience hypothesis and its predicted effects, consider a choice among apple pie, blueberry pie, or chocolate mousse as possible desserts, and then the task of estimating the popularity of these options among others. Suppose that Adam prefers the apple pie and Carol prefers the chocolate mousse. To evaluate the possibly different role of description changes, we contrast hypothetical assessments of the percentage of people who prefer "one of the pies" (packed) vs. "either apple pie or blueberry pie" (unpacked), for both Adam and Carol.

According to the preference salience hypothesis, for Adam his preferred option apple pie will tend to stand out from the packed description of the two pies. In effect, Adam may transform the packed description "one of the pies" into a spontaneously unpacked hypothesis such as "either the apple pie that I like, or the blueberry pie as well." Consequently, Adam's judgment of pie popularity would be relatively unaffected by the change in description of the encountered hypothesis (from packed to unpacked).

Carol, in contrast, will be more likely to assess the packed description as it is given, without transformation or spontaneous unpacking, because her more salient preferred option (chocolate mousse) does not reside in the packed set. "One of the pies" will seem relatively unpopular, but "either apple pie or blueberry pie" will make those individual options more salient to Carol, and increase her assessment of their popularity. The effect of unpacking the pie options, then, is predicted to be larger for (chocolate-mousse-loving) Carol than for (apple-pie-loving) Adam.

The preference–salience interaction described above can be summarized as smaller unpacking effects when the packed set contains the judge's preferred item. This summary expresses the interaction in terms of different unpacking effects as a function of preference. The same interaction can also be expressed in terms of different degrees of social projection as a function of item description. Specifically, the preference salience hypothesis predicts greater social projection when the judgment query involves packed rather than unpacked descriptions. From this perspective, unpacking options can reduce the amount of social projection by reminding the judge of the less salient non-preferred options. The intuition for this framing of the interaction is that non-preferred items have more impact on popularity judgments when unpacked rather than packed, whereas the more naturally-salient preferred item has similar impact whether unpacked or packed. Considering the interaction in these terms is particularly useful for decomposing distinct contributors to social projection. As discussed below, comparing the amount of social projection for packed and unpacked descriptions allows for determining the amount of social projection attributable to description-dependence, compared to the amount attributable to other factors. This decomposition is most transparent through a more formal analysis of these predictions within the framework of support theory.

Support theory

Support theory (Rottenstreich & Tversky, 1997; Tversky & Koehler, 1994) is a model of probability judgment designed to accommodate description-dependence of judgment. In contrast to the normative theory of probability, in which probabilities are attached to events, support theory attaches subjective probabilities to descriptions of events, termed *hypotheses*. Hypothesis *A* is assigned a support value $s(A)$ which is interpreted as a numerical measure of the strength of evidence favoring that hypothesis. Given two mutually exclusive and exhaustive hypotheses, the judged probability that the focal hypothesis A rather than the alternative hypothesis B holds is given by:

$$P(A,B) = \frac{s(A)}{s(A) + s(B)} \tag{1}$$

In this representation, likelihood judgment reflects an assessment of the balance of evidence favoring the focal hypothesis rather than the alternative hypothesis. In the present context of predicting the preferences of others, the support scale represents the strength of evidence that a particular option or set of options will be chosen by other people. Previous work has investigated several properties of the support scale $s(\cdot)$, in particular how the specificity of a hypothesis influences support, and found that support typically increases as a description of an event becomes more detailed (Brenner et al., 2002; but also see Sloman, Rottenstreich, Wisniewski, Hadjichristidis, & Fox, 2004).

Unpacking

Consider a hypothesis A which contains two mutually exclusive and exhaustive components A_1 and A_2. The packed hypothesis A and the unpacked hypothesis A_1 *or* A_2 are different descriptions of the same event, with the unpacked hypothesis predicted to evoke greater support due to the increased salience of the individual components. Furthermore, the individual components judged separately are predicted to produce more total support than the unpacked hypothesis. These properties of support are summarized by the two-part inequality:

$$s(A) \leqslant s(A_1 \text{ or } A_2) \leqslant s(A_1) + s(A_2) \tag{2}$$

The inequality between the two left-hand expressions reflects implicit subadditivity of support (Tversky & Koehler, 1994), contrasting the support for an implicit disjunction (packed description) with support for an explicit disjunction (unpacked description). The inequality between the two right-hand expressions reflects explicit subadditivity of support (Rottenstreich & Tversky, 1997), contrasting the support for an explicit disjunction with total support for the individual components of the explicit disjunction. In the present analysis, we will focus on total subadditivity of support by comparing $s(A)$ to $s(A_1) + s(A_2)$.

Modeling preferences in support theory

We now introduce a specific support theory model of the relationship between preferences and judgments of the preferences of others. Consider a judge indicating her preference among three items A, B and C. She also makes one or more judgments of the popularity of A, B and/or C among other people. These popularity judgments, interpreted as subjective probabilities or relative frequencies, are the data to be modeled with support theory.

The expression $P(A, \bar{A})$ represents the judgment of the popularity of option A vs. the other options packed together into the *residual* hypothesis $\bar{A}$ (read as "not A" or "something other than A"). The expression $P(A, B \vee C)$ represents the judgment of the popularity of option A vs. the unpacked residual hypothesis $B \vee C$ (read as "either B or C"). Based on the principle of subadditivity of support, unpacking the residual hypothesis is expected to increase its support, thus decreasing the overall judgment of A's popularity (because the residual hypothesis contributes to the denominator in the support theory representation in Eq. (1)). The difference $P(A, \bar{A}) - P(A, B \vee C)$ indexes the unpacking effect discussed previously.

To model social projection in this framework, we must distinguish between hypotheses involving preferred and unpreferred options. Let A_1 denote the hypothesis A when it has been chosen by the judge in the preference assessment phase, and let A_0 denote the hypothesis A when it has not been chosen by the judge in the preference assessment phase.

Example 1: $P(A_1, \bar{A}_1)$ represents the judgment of the popularity of the judge's preferred option A relative to its packed alternatives. If the residual hypothesis $\bar{A}_1$ were unpacked for this judge, the hypothesis would be denoted $B_0 \vee C_0$.

Example 2: $P(A_0, B_1 \vee C_0)$ represents the judged popularity of option A relative to the unpacked residual $B \vee C$, made by a judge who prefers option B.

The preference–salience interaction prediction is that hypotheses including the judge's favorite option will evoke a similar amount of support whether packed or unpacked, compared to hypotheses not including the judge's favorite. The judge's preference for an item in effect singles it out, and thereby immunizes it to some extent from being discounted when lumped together in an aggregate residual hypothesis. In contrast, the set of unchosen options is more easily represented together as a set (perhaps even thought of as "the ones I didn't choose" or "the ones I don't like as much.")

We can express the degree of subadditivity with the ratio of support for the packed description and the total support of its coextensional components:

$$w_{\bar{A}} = \frac{s(\bar{A})}{s(B) + s(C)} \tag{3}$$

This quantity represents the proportion of total support $s(B) + s(C)$ that is retained by the packed hypothesis $\bar{A}$. Smaller values of the w indicate relatively less support for the packed description compared to the unpacked, and thus larger observed unpacking effects.

In its simplest form, the proposed interaction between preference and unpacking entails a model with two distinct w's, depending on whether or not the disjunction contains the judge's chosen option. When A is the judge's preferred option, the residual hypothesis for a judgment of A can be represented as $s(\bar{A}_1) = w_0\,[s(B_0) + s(C_0)]$. We define the unpacking weight w_0 as the unpacking weight when the disjunction does not contain the judge's preferred option. Note here that the subscript for w indicates that the *residual* hypothesis contains all unchosen options (and therefore that the *focal* hypothesis is the judge's preferred option).

When B is the judge's favorite option, support for the residual hypothesis $\bar{A}_0$ is now represented using a different discounting weight (w_1), because the residual hypothesis now contains the chosen option: $s(\bar{A}_0) = w_1\,[s(B_1) + s(C_0)]$. The weight w_1 is the discounting weight when the disjunction contains the judge's preferred option (in this example, option B). Similarly, when C is the judge's favorite, the support for the residual hypothesis is $s(\bar{A}_0) = w_1\,[s(B_0) + s(C_1)]$.

The central prediction motivated by preference salience can be expressed in terms of these unpacking weights as $w_0 < w_1$: greater unpacking effects when the residual hypothesis involves all unchosen options than when the residual hypothesis contains the preferred option. We start with a relatively simple model with only two unpacking weights, but consider a more complex model with weights contingent on strength of preference in a later section.

The preceding discussion focused on the proposed preference–salience interaction between description-dependence and preference. We also include a general social projection effect, which can be modeled through a relationship between support for an option when chosen $s(A_1)$ and support for that option when not chosen $s(A_0)$. In general, social projection entails that there is greater support attached to a preferred option than to an equivalent unpreferred option; perceived evidence for an option's popularity is higher for those who prefer that option compared to those who prefer a different option. To capture social projection at the level of support, we use a multiplicative adjustment for the chosen or preferred option: $s(A_1) = \theta s(A_0)$, where $\theta > 1$. Given various judgments of $P(A, \bar{A})$ and $P(A, B \vee C)$ when either A, B, or C are chosen, we can estimate w_0, w_1, and θ (as well as the relative support for A, B and C). These parameters then can illustrate the changes in perceived support for different hypotheses as a function of the judge's own preferences.

It is helpful, both analytically and for exposition, to deal with a transformation of the judged likelihoods or frequencies into *odds*:

$$R(A,\bar{A}) = \frac{P(A,\bar{A})}{1 - P(A,\bar{A})} = \frac{s(A)}{s(\bar{A})}. \tag{4}$$

These odds expressions are analytically convenient because they are represented as ratios of support. To illustrate the full structure of the proposed model, Table 1 shows the support theory expressions for the various judgments (in odds form) involving packed and unpacked residual hypotheses, in the context of a choice among three options A, B and C, and then a judgment of the popularity of option A. Note that the projection parameter θ is attached to the preferred option throughout, and w_0 and w_1 are associated with packed hypotheses depending on whether the preferred option is included therein.

Decomposition of social projection

This model allows decomposing the total amount of social projection into a part associated with θ (representing potentially many cumulative factors leading to greater support for one's preferred option) and a part associated with the weights w_0 and w_1 (representing the role of description-dependence contingent on preference). To illustrate this decomposition most simply, we consider the case where B and C appear equally popular ($s(B_0) = s(C_0)$), and use odds ratios to index the amount of social projection. The amount of social projection when judging an unpacked residual hypothesis is given by:

$$\frac{R(A_1, B_0 \vee C_0)}{R(A_0, B_1 \vee C_0)} = \frac{\theta s(A_0)/[s(B_0) + s(C_0)]}{s(A_0)/[\theta s(B_0) + s(C_0)]} \tag{5}$$

when $s(B_0) = s(C_0)$, this expression reduces to $\theta(\theta + 1)/2$. Note that when $\theta = 1$ the social projection odds ratio is also 1; that is, there is no social projection.

Now consider the amount of social projection when judging a packed residual hypothesis:

$$\frac{R(A_1, \bar{A}_1)}{R(A_0, \bar{A}_0)} = \frac{\theta s(A_0)/w_0[s(B_0) + s(C_0)]}{s(A_0)/w_1[\theta s(B_0) + s(C_0)]} \tag{6}$$

when $s(B_0) = s(C_0)$, this expression reduces to $(\theta(\theta + 1)/2) * (w_1/w_0)$. Thus social projection when judging a packed residual hypothesis can be decomposed into a term based on generally greater support for chosen options ($\theta(\theta + 1)/2$) and a term based on the different amount of discounting for chosen and unchosen options (w_1/w_0). We can then assess the relative size of these two components – the θ-contribution and the w-contribution – within the total amount of social projection.

We now turn to empirical tests of the support model instantiating social projection and preference salience. We first test the qualitative predictions of an interaction between preference and unpacking (Experiment 1) and then estimate the proposed 2-weight model (Experiment 2). We then introduce expanded models for graded measures of preference, and test whether the relative attractiveness of the focal and residual options affects the size of the unpacking effect (Experiment 3). Finally, in Experiment 4, we examine judgments involving aversive choice options to distinguish between alternative accounts of the source of the preference–unpacking interaction.

Experiment 1

Experiment 1 aims to test the proposed interaction between preference and unpacking. We expected that the unpacking effect would be larger when the judge's preferred option is the focal option than when it is included in an implicit residual hypothesis.

Method

Participants

Participants were 833 undergraduate students who completed the task for extra credit.

Design and procedure

Participants responded to a series of six choice and judgment problems. First, they considered a set of three options (A–C) and indicated their favorite option. Then, they made popularity judgments, estimating the percentage of others who would choose certain options. Participants were randomly assigned to make judgments involving either packed or unpacked residual hypotheses.

Participants in the Packed condition estimated the percentage of people choosing option A (vs. the implicit residual hypothesis $\bar{A}$). In this condition, the two options B and C were implicitly packed together for the judgment. Participants in the Unpacked condition estimated the percentage of people choosing either B or C; for this group, the two options are explicitly unpacked. The popularity judgment for option A is then inferred by subtracting the judgment of either B or C from 100%, assuming binary complementarity (Tversky & Koehler, 1994).

Responses were made by filling in one of five bubbles on an optical scanning form. The five response categories were labeled 0–20%, 21–40%, 41–60%, 61–80%, 81–100%. For analysis, we use the midpoint of the chosen response category (e.g., 10 if the response category 0–20% is chosen). Six choice problems were considered, in a fixed order, involving the categories of desserts, sandwiches, drinks, soups, snacks, and magazines.

Results

Overall, there was a significant overall unpacking effect in judgments of item popularity: the average judgment of the focal option with packed residual ($M_{Packed} = 47.6\%$) was higher than the average judgment of the focal option with unpacked residual ($M_{Unpacked} = 45.0\%$, $t(831) = 3.57$, $p < .0001$). Five of the six problems (all except the soup category) show higher judgments of option A in the Packed-Residual condition.

Table 1
Support theory expressions for judged odds of A vs. alternatives (2-weight model).

	Unpacked alternatives: odds for judgment of A vs. *unpacked* residual $B \vee C$	Packed alternatives: odds for judgment of A vs. *packed* residual $\bar{A}$
A is preferred	$\frac{\theta s(A_0)}{s(B_0) + s(C_0)}$	$\frac{\theta s(A_0)}{w_0(s(B_0) + s(C_0))}$
B is preferred	$\frac{s(A_0)}{\theta s(B_0) + s(C_0)}$	$\frac{s(A_0)}{w_1(\theta s(B_0) + s(C_0))}$
C is preferred	$\frac{s(A_0)}{s(B_0) + \theta s(C_0)}$	$\frac{s(A_0)}{w_1(s(B_0) + \theta s(C_0))}$

We find the predicted interaction between the description of the residual hypothesis and the judge's preference. Collapsing over the six categories, the unpacking effect is reliably larger when the focal option is the judge's preferred option (M_{Packed} = 51.9 vs. $M_{Unpacked}$ = 48.0) compared to when the judge's preferred option is included in an implicit residual hypothesis (M_{Packed} = 42.9 vs. $M_{Unpacked}$ = 41.9, $t(829) = 2.2$, $p < .05$).

This interaction can also be considered in terms of the degree of social projection depending on the description of the residual hypothesis. To account for potential dependence of a participant's responses across the six choice problems, we consider the relationship between the average popularity judgment of the focal option and the proportion of choices in which the focal option was chosen. Both of these variables are defined for each participant. For this analysis, the average popularity judgment for the focal option is predicted from the proportion of focal choices across the six categories. The slope from this regression is an estimate of social projection averaged over the six problems (i.e., the difference in average popularity judgment comparing choosers with non-choosers). As predicted by the preference salience hypothesis, social projection is indeed significantly larger (b = 14.1, SE = 2.7) when the residual hypothesis is packed then when unpacked (b = 6.6, SE = 2.2; $t(829) = 2.2$, $p < .05$ for the difference in slopes). The degree of social projection is roughly cut in half when the residual hypothesis is unpacked. The predicted qualitative interaction pattern predicted by preference salience is found in five of the six problem categories.

Experiment 2

The results of Experiment 1 provide initial support for the preference salience hypothesis.

Unpacking effects were smaller when the residual hypothesis contained the judge's preferred option, consistent with the notion that the preferred option is more salient and stands out regardless of the given description of the residual hypothesis. Equivalently, social projection is reduced when the residual hypothesis is unpacked and less-liked options are made more salient. However, in Experiment 1 options B and C were always paired together (either as a focal explicit disjunction, or an implicit disjunction as the residual hypothesis); as a result, the individual support values for B and C and the key parameters of the model described earlier (θ, w_0, w_1) were not estimable. The design of Experiment 2 allows separate estimation of these parameters, and allows a direct test of the predicted inequality between unpacking weights for hypotheses containing and lacking the preferred item: $w_0 < w_1$.

Method

Participants

Participants were 139 undergraduate students who completed the task for extra credit.

Design and procedure

Participants encountered the same six choice problems as in Experiment 1. As before, all participants first chose among the three options. Participants in the Packed-Residual condition then assessed the popularity of a single designated option A, leaving the residual hypothesis implicit. The instructions in the Packed-Residual condition read:

Deli Sandwiches (please circle your preferred option)
Turkey Tuna Salad Ham & Cheese

Now think about other students (at your university) choosing among these three options. Please estimate the percentage of students who would choose Turkey:

______% of students would choose Turkey

In the Unpacked-Residual condition, participants assessed the individual popularity of each of the three options (A, B and C):

Deli Sandwiches (please circle your preferred option)
Turkey Tuna Salad Ham & Cheese

Now think about other students (at your university) choosing among these three options. Please estimate the percentage of students who would choose each option. (Make sure that your percentages add up to 100%.)

______% of students would choose Turkey
______% of students would choose Tuna Salad
______% of students would choose Ham & Cheese

Participants then completed the same procedure for each of six product categories.

Results

Average choice shares and popularity judgments for each option are presented in Table 2. Consistent with the preference–salience prediction, the interaction between the unpacking manipulation and whether the focal option was chosen was significant ($t(135) = 1.99$, $p < .05$). The unpacking effect is again larger when the focal option is chosen (M_{Packed} = 53.4% vs. $M_{Unpacked}$ = 46.9%) compared to when the preferred option is in the residual (M_{Packed} = 43.0% vs. $M_{Unpacked}$ = 43.1%). Equivalently, social projection is larger when the residual is packed ($M_{Focal\text{-}chosen}$ = 53.4% vs. $M_{Non\text{-}focal\ chosen}$ = 43.0%; difference = 10.4%) than when it is unpacked ($M_{Focal\text{-}chosen}$ = 46.9% vs. $M_{Non\text{-}focal\ chosen}$ = 43.1%; difference = 3.8%). Social projection shrinks by over 60% when the residual hypothesis is unpacked, implying that discounting implicit less-preferred options accounts for a substantial portion of total social projection when the residual is packed. Fig. 1 displays the amount of social projection for each condition and choice category; the predicted qualitative interaction pattern appears for five of the six individual categories.

Modeling. The model discussed earlier assumes a relationship between the support for chosen and unchosen options ($s(A_1) = \theta(A_0)$), and allows for different discounting weights when the residual hypothesis either contains (w_1) or does not contain (w_0) the judge's preferred option. Without loss of generality, the support for hypothesis C_0 is set to 1 for each category. To fit the model, we estimate $s(A_0)$, $s(B_0)$, the social projection factor θ, and the two discounting weights w_0 and w_1. Our central hypotheses are addressed by the θ parameter (expected to be greater than 1, illustrating overall social projection assessed at the level of support) and the ordering of the w_0 and w_1 parameters, with w_0 predicted to be less than w_1. This model was estimated separately for each of the individual choice categories, and also overall across all six categories. In the overall model-fitting across the six categories, 12 individual support parameters ($s(A_0)$, $s(B_0)$ for each category) were estimated along with single across-category estimates of θ, w_0, and w_1. These nonlinear models of the judged probabilities were estimated using weighted least squares in SAS PROC NLIN (using the Gauss–Newton method and convergence criterion of 10^{-5}). Null hypothesis values for each parameter were used as starting values ($\theta = 1$, $w_0 = 1$, $w_1 = 1$). All estimated models converged quickly, in fewer than 10 iterations, and parameter estimates were quite robust to other estimation methods.

Table 3 displays the resulting parameter estimates. In the overall model, the estimate of θ is 1.15, significantly greater than 1

Table 2
Average choice shares and probability judgments for Experiment 2.

	Option *A*	Option *B*	Option *C*
Desserts	Cheesecake	Pecan Pie	Peach Cobbler
Choice Share	73.4	12.9	13.7
Avg. Judged Popularity (Unpacked/Packed)	54.0/55.5	23.2	22.8
Sandwiches	Turkey	Tuna	Ham
Choice Share	66.9	8.6	24.5
Avg. Judged Popularity (Unpacked/Packed)	47.6/53.5	22.3	30.2
Beverages	Coke	Apple Juice	Frappuccino
Choice Share	53.2	28.8	18.0
Avg. Judged Popularity (Unpacked/Packed)	53.9/58.7	16.0	30.1
Soups	Chicken Noodle	Clam Chowder	Tomato
Choice Share	55.8	34.8	9.4
Avg. Judged Popularity (Unpacked/Packed)	52.5/48.3	26.1	21.4
Snacks	Granola Bar	Potato Chips	Snickers
Choice Share	40.3	32.4	27.3
Avg. Judged Popularity (Unpacked/Packed)	28.1/38.0	37.8	34.1
Magazines	People	Time	Sports Illustrated
Choice Share	37.2	19.0	43.8
Avg. Judged Popularity (Unpacked/Packed)	34.2/39.2	20.3	45.4

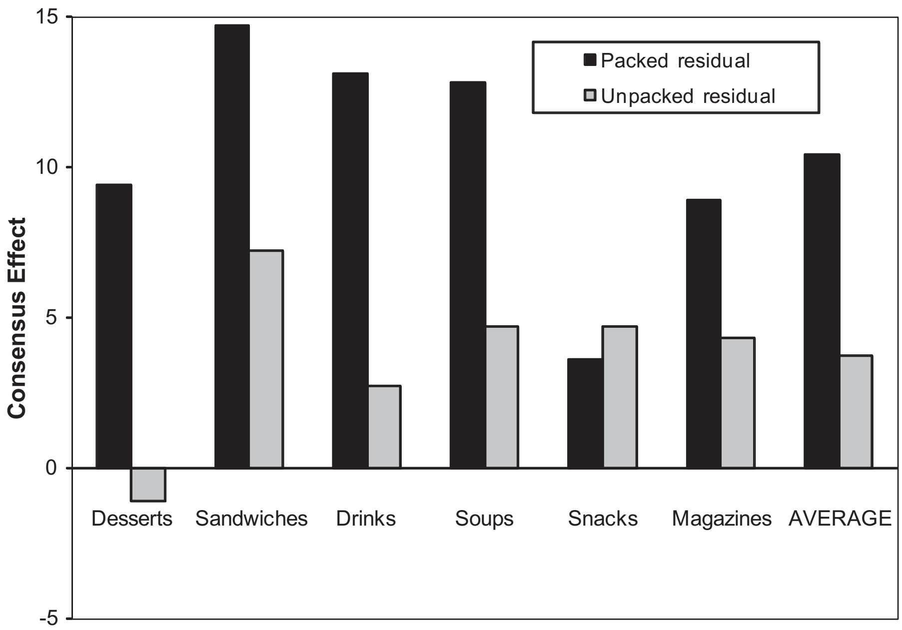

Fig. 1. Consensus effect by choice category and condition (packed or unpacked residual hypothesis) for Experiment 2. Consensus effect is defined as the difference in judged popularity of option *A* for those who prefer *A* compared to those who do not prefer *A*.

(SE = .030, z = 5.1, p < .001), consistent with the traditional finding of social projection. This value suggests that, on average, those who prefer an option perceive 15% more support for its popularity than those who do not prefer it.

Now consider the unpacking weights, which represent the amount of support maintained by the packed residual hypothesis, compared to the total support of its constituents. For residual hypotheses not containing the preferred option, the estimated w_0 of .79 is significantly less than 1 (SE = .038, z = 5.6, p < .001) and also significantly less than the estimated w_1 of .96 (SE = .063, z = 2.65, p < .01). This pattern supports the primary prediction that discounting of support is more pronounced for residual hypotheses containing non-preferred options.

Interpreting the parameter estimates for the overall model, a given option accrues 15% more evidential support for its popularity when preferred than when not preferred by the judge (θ = 1.15). There is essentially no subadditivity of support for residual hypotheses that include the judge's chosen option (w_1 = .96); the support for the packed residual hypothesis containing the preferred option is fully 96% of the total support for the individual components. However, there is substantial discounting of support for residual hypotheses composed of non-preferred options (w_0 = .79); support for the packed residual with unchosen options is only 79% of the total support for the individual components. In other words, over a fifth of total support is "lost" when grouping together the unchosen options. An analysis of the individual items shows a rather consistent pattern of results in the parameter estimates. The estimated social projection factor θ is greater than 1 for all six categories and w_0 is less than w_1 for five of six categories (see Table 3).

Table 3
Estimated parameter values for choice-based unpacking model fit to Experiment 2 data.

	$s(A)$	$s(B)$	θ	w_0	w_1
Desserts: Cheesecake, Pecan Pie, Peach Cobbler	2.35	1.02	1.01	0.86	1.23
Sandwiches: Turkey, Tuna, Ham	1.45	0.75	1.22*	0.72*	0.96
Beverages: Coke, Apple Juice, Frappuccino	1.72	0.52	1.14	0.70*	1.00
Soups: Chicken Noodle, Clam Chowder, Tomato	2.26	1.17	1.17*	1.02	1.33*
Snacks: Granola Bar, Potato Chips, Snickers	0.79	1.10	1.26*	0.71*	0.58*
Magazines: People, Time, Sports Illustrated	0.76	0.45	1.05	0.67*	0.90
Overall			1.15*	0.79*	0.96

$s(C) = 1$ for each category.
* Parameter significantly different from 1 at $p < .05$.

Decomposition of social projection

Recall that the total social projection with a packed residual hypothesis (the odds ratio $R(A_1, (\bar{A}_1))/R(A_0, (\bar{A}_0))$) can be expressed as $(\theta(\theta+1)/2) * (w_1/w_0)$, where the first term represents the role of the aggregate social projection factor θ and the second term represents the role of preference salience (greater discounting for unchosen options). For the overall model, we find the total social projection odds ratio to be 1.502 when the residual is packed, and 1.236 when unpacked. The value for the unpacked residual represents the θ-contribution – a factor of 1.24, or a 24% increase in the perceived popularity (measured in odds) of an option when preferred than not. The odds ratio for the packed residual reflects both the θ- and w-contributions. We determine the w-contribution as 1.502/1.236 = 1.215, or a roughly 22% additional increase in perceived popularity for the preferred option when the residual is packed rather than unpacked. This analysis suggests that in these data the θ-contribution and w-contribution to overall social projection are comparable in size – that the discounting of unchosen options is as much a contributor to social projection as the general support adjustment factor θ.

Experiment 3

The previous two experiments illustrate how unpacking effects depend on the judge's preference. Greater unpacking effects were found when the residual hypothesis contains only unchosen options. In terms of the discounting weights, unchosen options lose relatively more support when packed together ($w_0 < w_1$). If preference salience indeed explains the observed interaction between preference and unpacking, then this interaction should be sensitive to the degree to which the judge finds the packed options attractive. In Experiment 3, we seek evidence for a generalized version of preference salience by exploring whether unpacking effects vary continuously with the relative attractiveness of the options in the residual hypothesis. Preference salience would suggest greater salience for *more attractive* options in the residual hypothesis, even if they are not chosen as the favorite, and thus less discounting for residual hypotheses including these more attractive options.

This *attractiveness-based* model of unpacking weights essentially extends the binary distinction between preferred and rejected options in a discrete choice to graded measures of option attractiveness. Instead of simply having two unpacking weights, for residual hypotheses with (w_1) and without (w_0) the chosen option, we consider a model where the degree of discounting varies continuously with the relative attractiveness of the options in the residual hypothesis.

Attractiveness-based discounting model

Let r_A, r_B, r_C denote the judge's ratings of attractiveness for each option in the choice set (for example on a scale from 1 to 9). We consider how the unpacking weight for a residual hypothesis may depend on the relative attractiveness of the options in the residual compared to the focal option. Consider the case where A is the focal hypothesis and the residual hypothesis $\bar{A}$ contains options B and C.

The unpacking weight for the residual hypothesis $\bar{A}$ is modeled as $w_{\bar{A}} = w_{\bullet}\beta^{\bar{r}_{BC}-r_A}$, where $\bar{r}_{BC}$ is the average attractiveness of the two options in the residual hypothesis. The parameter $w_{\bullet}$ represents a baseline unpacking weight, for the case where the focal option and the residual options are equally attractive ($\bar{r}_{BC} = r_A$). The parameter β represents the multiplicative change in the discounting weight depending on the difference in attractiveness. For each additional rating point by which the residual options are more attractive than the focal option, the discounting weight is multiplied by β. If, consistent with preference salience, more attractive items are more salient, and therefore less susceptible to unpacking effects, then β is predicted to be greater than 1. In other words, the discounting weight is predicted to increase systematically, indicating less and less discounting, with the relative attractiveness of the residual options. If discounting is unrelated to the attractiveness of the options within the residual hypothesis, then β should equal 1. An observed $\beta < 1$ would indicate lower w's and greater discounting for residual hypotheses containing relatively attractive components. In Experiment 3, we gather the attractiveness ratings needed to fit this expanded model of the interaction between preference and unpacking.[1]

Method

Participants

Participants were 189 undergraduate students who completed the study for extra credit.

Design and procedure

The experiment was administered via personal computers. The only substantive procedural difference from Experiment 2 was that after indicating their most preferred item for a choice problem, and before making popularity judgments, participants rated the attractiveness of each of the three options. These attractiveness ratings were restricted in that the preferred option could not be rated as less attractive than either of the unchosen options; participants reported their answers to the attractiveness questions on a 9-point scale anchored by "don't like at all" (1) and "like very much" (9).

After providing the attractiveness ratings, participants made popularity judgments about one or more items, depending on their randomly assigned condition. One group of participants (Unpacked-Residual condition) provided popularity judgments for each of the three options for each choice problem. The remaining

[1] Numerous other models are possible, including ones in which the support values themselves are treated as a function of relative attractiveness, in effect extending the projection parameter θ to a continuous measure of preference. For consistency with the central focus on preference salience, we restrict our attention to models in which the discounting weights vary with relative attractiveness.

Table 4
Average choice shares and probability judgments for Experiment 3.

	Option *A*	Option *B*	Option *C*
Desserts	Cheesecake	Pecan Pie	Peach Cobbler
Choice Share	68.4	19.1	12.5
Avg. Judged Popularity: Unpacked	53.5	24.1	22.4
Avg. Judged Popularity: Packed	57.2	31.2	24.9
Sandwiches	Turkey	Tuna	Ham
Choice Share	67.1	15.1	17.8
Avg. Judged Popularity: Unpacked	44.8	21.5	33.7
Avg. Judged Popularity: Packed	57.7	31.4	45.2
Beverages	Coke	Apple Juice	Frappuccino
Choice Share	50.0	27.0	23.0
Avg. Judged Popularity: unpacked	53.2	14.8	32.0
Avg. Judged Popularity: Packed	59.5	30.3	49.5
Soups	Chicken Noodle	Clam Chowder	Tomato
Choice Share	52.0	36.8	11.2
Avg. Judged Popularity: Unpacked	52.4	25.6	22.0
Avg. Judged Popularity: Packed	58.0	39.0	25.1
Snacks	Granola Bar	Potato Chips	Snickers
Choice Share	50.7	30.9	18.4
Avg. Judged Popularity: Unpacked	25.2	42.5	32.3
Avg. Judged Popularity: Packed	37.4	56.0	55.0
Magazines	People	Time	Sports Illustrated
Choice Share	51.3	25.7	23.0
Avg. Judged Popularity: Unpacked	34.4	24.2	41.3
Avg. Judged Popularity: Packed	46.8	34.4	52.4

three Packed-Residual conditions each involved a designated option (either *A*, *B* or *C*) as the focal hypothesis, with the other two options forming an implicit residual hypothesis. By varying the focal hypothesis across conditions, this procedure allows estimation of unpacking weights for various residual hypotheses (i.e., $\bar{A}, \bar{B}, \bar{C}$ for each of the six product categories), which can differ substantially in their rated attractiveness. The relationship between unpacking weights and the relative attractiveness of the options in the residual hypothesis can then be assessed, by fitting the attractiveness-based discounting model with $w_{\bar{A}} = w_{\bullet}\beta^{\bar{r}_{BC}-r_A}$ described above.

Results

Descriptive statistics for the popularity judgments for the various categories are presented in Table 4. In all 18 comparisons for the six categories and three options, the average judgment of an option's popularity is greater when the alternatives are packed than unpacked.

We fit the attractiveness-based model of unpacking weights to the popularity judgments for each of the six individual choice categories, and also across all six problems, again using Gauss–Newton weighted least squares fitting in SAS PROC NLIN, with null hypothesis values for the parameters as starting values. Table 5 displays the resulting estimates of the baseline support values for each option, the social projection adjustment factor θ, the baseline weight $w_{\bullet}$, and the attractiveness-based unpacking weight adjustment factor β. A value of $\theta > 1$ again indicates a social projection main effect at the level of support, and a value of $\beta > 1$ indicates the predicted preference–salience interaction: larger weights (and therefore less discounting and smaller unpacking effects) as the options in the residual hypothesis are relatively more attractive. For the model estimated across categories, support values were estimated for each individual option, with common values of θ, $w_{\bullet}$, and β across all categories.

Based on the parameters from the overall model fit, an option tends to receive 17% more support when chosen than unchosen ($\theta = 1.17$, $SE = .032$, $z = 5.3$, $p < .05$), very similar to the results of Experiment 2 ($\theta = 1.15$). As predicted, the degree of subadditivity in the residual hypothesis varies with the attractiveness of the options within the residual hypothesis, with the weight w increasing by 3.0% for each additional rating point ($\beta = 1.030$, $SE = .0098$, $z = 3.1$, $p < .05$).

The pattern of parameter values is quite stable across the six choice categories. In all cases, estimated β is greater than 1, consistent with the main hypothesis that unpacking effects shrink as the options in the residual hypothesis are more attractive. The projection factor θ is greater than 1 for all but one category. The baseline unpacking weight $w_{\bullet}$ is always substantially less than 1, indicating overall unpacking effects when the residual options are (on average) as attractive as the focal option.

In sum, the results show that less attractive options are discounted the most when included implicitly within a packed hypothesis. In contrast, more attractive options are less susceptible to discounting. Consistent with preference salience, the findings suggest that more attractive options are more naturally salient, irrespective of the idiosyncratic way (packed or unpacked) that they are presented.

This model can also be used to assess the relative roles of θ and the unpacking weights for social projection. The analysis is somewhat more complicated than the simple decomposition discussed earlier, where w_1/w_0 represented the contribution of the differential unpacking weights – how greater discounting of unchosen options contributes to the total amount of social projection. In the current expanded model, there is not just one simple w_1/w_0 ratio – instead we can consider the ratio of weights corresponding to different levels of relative attractiveness between the focal and residual options (i.e., $\bar{r}_{BC} - r_A$). Consider contrasting the case of equally attractive focal and residual options ($\bar{r}_{BC} - r_A = 0$) vs. the case where the residual contains options δ points more attractive than the focal option ($\bar{r}_{BC} - r_A = \delta$). Given the multiplicative nature of the weight model, the relevant ratio of weights would then be β^{δ}.

For illustration, consider a 6-point shift in relative attractiveness. This corresponds to a comparison between someone who prefers the focal option by three points ($\bar{r}_{BC} - r_A = -3$) and someone who prefers the residual options by three points ($\bar{r}_{BC} - r_A = 3$). Given the parameter values for the overall model fit to the Experiment 3 data, the θ-contribution to social projection is a factor of 1.27. The w-contribution to social projection (given a

Table 5
Estimated parameter values for ratings-based model fit to Experiment 3 data.

	$s(A)$	$s(B)$	$\theta\ s(A_1) = \theta(A_0)$	$w_\bullet$	$\beta\ w_{\bar{A}} = w_\bullet \beta^{\bar{r}_{BC} - r_A}$
Desserts: Cheesecake, Pecan Pie, Peach Cobbler	2.22	1.15	1.06	0.82*	1.052*
Sandwiches: Turkey, Tuna, Ham	1.22	0.66	1.19*	0.61*	1.020
Beverages: Coke, Apple Juice, Frappuccino	1.44	0.50	0.99	0.55*	1.055*
Soups: Chicken Noodle, Clam Chowder, Tomato	2.16	1.28	1.29*	0.72*	1.031
Snacks: Granola Bar, Potato Chips, Snickers	0.61	1.12	1.25*	0.51*	1.032
Magazines: People, Time, Sports Illustrated	0.81	0.59	1.17*	0.62*	1.030
Overall			1.17*	0.63*	1.030*

$s(C) = 1$ for each category.
* Parameter significantly different from 1 at $p < .05$.

6-point attractiveness change) is $\beta^6 = 1.03^6 = 1.19$. Similar to the decomposition for Experiment 2, it appears that greater discounting of less-liked options contributes substantially to social projection. An 8-point change in relative attractiveness would make the w-contribution equal in size to the θ-contribution ($1.03^8 = 1.27$).

Experiment 4

The three experiments so far have established that preference for an item tends to be associated with (a) increased support for that item's popularity, as reflected by $\theta > 1$, and (b) reduced susceptibility to discounting when that item is packed in a residual hypothesis (as reflected by $w_1 > w_0$ in Experiment 2 and $\beta > 1$ in Experiment 3). The former result is a characterization of social projection defined at the level of the support construct. The latter result is consistent with preference salience, where more preferred options tend to naturally stand out, and are less likely to be discounted when included in a packed residual hypothesis. Further, we find that the greater amount of discounting for less-liked packed options contributes substantially to aggregate social projection – its contribution is comparable in size to the contribution of θ.

But is it indeed preference for an option that makes it less susceptible to discounting? Consider an alternative account of option salience centered on the *intensity* of hedonic reactions to choice options, rather than on greater or lesser *liking* for those options. Because the options in the previous three experiments were all generally attractive or desirable options, preference for an item is confounded with the intensity of the response to that item. More preferred options are associated with more intense positive feelings than less-preferred options. In Experiment 4, we disentangle a preference-based interpretation of salience from an intensity-based interpretation by examining choices and predictions involving aversive options.

In the case of aversive choice options, the least preferred item is the option eliciting the most intense negative feeling, whereas the most preferred elicits the least intense or mildest negative feeling – the evaluation closest to neutrality. To illustrate, consider someone choosing among medications that differ in terms of their unpleasant side effects, producing either *headaches*, *nausea*, or *nosebleeds*. Suppose Bob prefers headaches over nosebleeds over nausea. Which option will be most naturally salient to Bob when he assesses the preferences of others? Will it be the most preferred option *headaches*, or the most intensely-evaluated option *nausea*?

These two accounts of option salience can be discriminated by the parameter β in the attractiveness-based model applied to popularity judgments for choices among aversive options. If more attractive options are more salient, then we should again observe $\beta > 1$, as found for the attractive options in Experiment 3. However, if more intensely-evaluated options are more salient (i.e., the most aversive options stand out the most) then we should observe $\beta < 1$ for judgments of aversive options.

Method

Participants

Participants were 465 undergraduate students who completed the study for extra credit.

Design and procedure

The procedure is identical to Experiment 3, except that choices were made among seven sets of aversive choice options. Choice categories included items such as side effects from medicines (headache, nausea, or nosebleeds), chores (vacuuming, laundry, or cleaning dishes), and course assignments (exam, paper, or class presentation). After indicating the preferred option from each category, participants rated the *unpleasantness* of each option from (1) not at all unpleasant to (9) extremely unpleasant. These ratings were again restricted such that the chosen option could not be rated as more unattractive than either of the unchosen options.

The relative attractiveness of the residual options ($\bar{r}_{BC} - r_A$) is derived from these ratings of unpleasantness; we create implicit attractiveness ratings analogous to those in Experiment 3 by subtracting the unattractiveness ratings from 10. Thus, as before, $\bar{r}_{BC} - r_A$ increases with the greater attractiveness of the residual options relative to the focal option, and therefore the β parameter has the same interpretation, measuring the change in the unpacking weight w as the residual options get relatively more attractive. Greater salience for more attractive options implies $\beta > 1$: as the options get more attractive, the discounting weight increases (and less discounting occurs). Greater salience for more intensely-evaluated options implies $\beta < 1$: as the options get worse (i.e., more intensely aversive), the discounting weight increases.

Results

We estimated the attractiveness-based model of unpacking weights for both individual items and overall, again using Gauss–Newton weighted least squares method in SAS PROC NLIN. Table 6 displays the resulting parameter estimates.

Overall, and for each choice category, we observe $\beta > 1$; unpacking weights increase with the attractiveness of the options in the residual hypothesis. This is consistent with the view that more preferred options – not the most intensely-evaluated negative options – are more likely to naturally emerge from the packed residual hypotheses. Indeed, the size of this effect ($\beta = 1.054$, SE = .008, $p < .01$) is substantially larger than that observed in Experiment 3 with attractive options ($\beta = 1.030$, SE = .0098, $p < .05$). For aversive options, each additional point of attractiveness for the residual options is associated with a 5.4% increase in the unpacking weight; for attractive options, each additional point of attractiveness for the residual options was associated with a 3.0% increase in the unpacking weight. Thus, the results from the aversive options suggest even more extreme preference salience, and no suggestion of greater inherent salience for more intensely-evaluated aversive options.

Table 6
Estimated parameter values for ratings-based model fit to Experiment 4 data.

	Social projection factor θ $s(A_1) = \theta(A_0)$	$w_\bullet$ Baseline unpacking weight	β Multiplicative change in unpacking weight $w_{\bar{A}} = w_\bullet \beta^{r_{BC}-r_A}$
Side effects: headache, nosebleed, nausea	1.63*	1.09	1.139*
Chores: vacuum, laundry, dishes	1.50*	0.79*	1.049*
Traffic penalties: fine, traffic school, litter collection	1.69*	0.73*	1.074*
Bad roommates: nightowl, noisy, dirty	1.90*	0.70*	1.004
Class assignments: presentation, exam, paper	1.32*	0.78*	1.011
Bad jobs: long commute, boring coworkers, little vacation	1.42*	0.88*	1.076*
Travel annoyances: flight delay, multiple stops, long drive	1.58*	0.86*	1.072*
Overall	1.54*	0.82*	1.054*

* Parameter significantly different from 1 at $p < .05$.

Several interesting differences emerge when contrasting the results of the attractive options in Experiment 3 and the aversive options in Experiment 4. There is less overall discounting for the aversive options ($w_\bullet = .82$, SE = .014) than for the attractive options ($w_\bullet = .63$, SE = .015). However, the relationship between unpacking and preference is stronger for the aversive options ($\beta = 1.054$) than the attractive options ($\beta = 1.030$). Also, the overall size of the social projection factor is much larger for the aversive ($\theta = 1.54$, SE = .027) than the attractive options ($\theta = 1.17$, SE = .032). For the aversive options, support is fully 54% larger when the judge prefers an option than when she does not.[2] This suggests that social projection is more pronounced for predictions about avoid/avoid conflicts than for approach/approach conflicts. Together, the more extreme values of both β and θ for choices among aversive options suggest that the link between one's own preferences and beliefs about others' preferences may tend to be stronger in the negative than in the positive domain. The θ parameter defines a direct link between preference and beliefs about others' preferences (preferred option accrues more support), whereas the β parameter defines a more complex "second-order" link between preference and belief – the sensitivity of implicit discounting to the attractiveness of the options. In terms of aggregate social projection, these parameters suggest both a larger θ-contribution and a larger w-contribution to projection for aversive than attractive options.

We can also assess the relative roles of θ and w in contributing to social projection for the aversive options. Given the large value of θ for aversive options, the θ-contribution to the odds ratio is a massive 1.96. We again find a substantial w-contribution in the case of the aversive options. Using the overall model, and a 6-point change in relative attractiveness, the w-contribution is estimated to be $1.054^6 = 1.37$. Relative to the θ-contribution for the aversive options, this may seem rather small, but note that it is quite large in an absolute sense, compared to the attractive options (where the 6-point-w-contribution was 1.19 compared to a 1.27 θ-contribution). The qualitative conclusion is again that the greater discounting of less-liked options contributes substantially to observed social projection. People project their preferences onto others in part because they discount or neglect alternatives that are described implicitly. Furthermore, this phenomenon is even more pronounced for aversive options than attractive ones (at least for the particular stimuli used in these studies).

[2] The finding that social projection is larger for aversive than positive options seems at odds with some recent research suggesting greater projection for liked than for disliked options (Hsee, Rottenstreich, & Tang, 2010; Gershoff, Mukherjee, & Mukhopadhyay, 2008; Nelson, Simmons, & Galak 2007). However, we should note some critical procedural differences in these other studies. Most notably, for many tasks these researchers used stimuli for which people may indicate relative liking (e.g., shapes, faces, ice cream sundaes), but which are not plausibly considered truly aversive options. A person may "dislike" a shape, but shapes are generally not truly aversive in the sense that medical side effects such as nausea are. Other procedural or analytic differences could contribute to divergent results for judgments involving truly aversive stimuli. For instance, in Nelson et al.'s studies involving aversive stimuli, participants were asked to assess the percentage of others who shared their preference (i.e., how many others made the same preference as you). In contrast, in the present procedure, participants estimated the percentage of others choosing a particular option.

General discussion

We have investigated the joint influences of option description and the judge's own preference on predictions of the preferences of others. Across four studies, we find consistent interactions between preference and event description on judgments of others' preferences. Unpacking effects shrink as the residual hypothesis includes more attractive options. This pattern is consistent with the idea that more attractive items are consistently more salient and therefore less susceptible to being discounted within a residual hypothesis. This interaction can also be interpreted in terms of greater social projection when the residual hypothesis is packed rather than unpacked, because less-preferred options are discounted more when implicitly described.

Furthermore, we observe similar interactions between preference and unpacking for popularity judgments of both attractive and aversive choice options. The consistent results for aversive options argue against an alternative interpretation of salience based on hedonic intensity rather than preference. The fact that the most intensely negative options do not have consistently increased salience is broadly consistent with research that shows people may avoid, suppress, or fail to attend to negative information for both motivational (Wegener, Petty, & Smith, 1995) and cognitive reasons (Gasper & Clore, 2002).

Although past studies have not directly addressed the role of packed and unpacked descriptions on social projection, our findings can be seen as broadly consistent with some earlier interpretations of social projection. Gilovich (1990) found that the false consensus effect increased with increasing latitude of the choice task for construal. That is, a more specific version of a choice problem reduced the size of the consensus effect. An analogy can be drawn between "latitude of construal" and explicitness of description, in that packed descriptions allow greater flexibility of interpretation for the judge. How a judge interprets "not *A*" is up to them; there is greater latitude of construal for "not *A*" than there is for a more explicit unpacked hypothesis such as "*B* or *C*." A packed or implicit description of a set of options offers greater flexibility in subjective construal, which can contribute to greater social projection, consistent with Gilovich (1990).

Preference salience or salience based on choosing

A potential alternative account of our central finding is that the interaction between the judge's own preference and the description of the possible options arose not because preferred options are indeed consistently salient, but because the mere act of choosing the preferred option in the experimental tasks increased its salience, which carried over to the subsequent popularity judgment task. By this view, the results may be an artifact of the particular experimental task, and not attributable to a more general cognitive process such as preference salience. There are several arguments against this alternative interpretation. First, in Experiments 3 and 4, after indicating their personal preferences, participants rated the attractiveness of all three options right before the popularity estimates. If an attentional asymmetry arose from singling out the preferred option in the choice task, rating each option should work to equalize the salience of all the available options. Even if the rating task did not completely eliminate any spurious salience boost of selecting the preferred option, one would expect the preference salience patterns to decrease when the rating task occurred after the choice task. But the results of Experiments 3 and 4 show no such decrease compared to the experiments which did not involve attractiveness ratings.

Second, by showing that the degree to which an option is preferred affects the size of the unpacking effect, Experiments 3 and 4 suggest a role for preference-based salience beyond any salience induced by the act of choosing the favorite item. The degree of preference for an option should not be continuously related to the amount of discounting if the effect is driven purely by salience arising from the mere act of choosing, and not by salience related to the preference for an option.

Third, if the act of singling out the chosen option during the choice task indeed substantially increases its salience, then this might itself exacerbate the amount of social projection. One would then expect that completing the popularity estimate before rather than after the choice task should weaken the amount of social projection, compared to the choose-then-estimate sequence. The present data cannot evaluate this comparison directly, but prior research does not support this prediction. In their meta-analysis of the false consensus effect, Mullen et al. (1985) showed that first making a popularity judgment and then indicating one's own preference actually led to a slightly increased degree of projection. Although it is certainly possible that some aspects of the choice task could artifactually manipulate option salience, this explanation cannot account for the full pattern of results consistent with the preference–salience predictions.

Modeling beliefs about others' preferences

In addition to the empirical findings, this study also illustrates support theory's flexibility as a framework for modeling predictions of others' preferences, accommodating both social projection in general and the aforementioned interactions between preference and unpacking. The initial binary-preference model contrasted unpacking weights for residual hypotheses including or excluding the most preferred option. A subsequent model represented unpacking weights as a function of the relative attractiveness of the options in the residual hypothesis, with greater discounting for residual hypotheses consisting of less attractive options.

A notable feature of modeling popularity judgments with support theory is that it allows a decomposition of contributors to social projection. A substantial part of the total projection observed when the residual hypothesis is packed can be attributed to differences in discounting. Modeling in terms of support theory allows a clean separation between a general social projection effect at the level of support (as represented by the θ parameter) and changes in the degree of subadditivity (as represented by the w's). We consistently find that the greater discounting of less-preferred options contributes substantially to the total degree of social projection, generally comparably to the overall θ factor representing the greater support attached to chosen options.

Another benefit of the support modeling approach is that social projection can be assessed at the level of the individual choice option. Although not directly explored here, it is possible to expand the support models to include item-specific projection factors θ_i. Preferences for some options may tend to be projected more than others. For instance, one hypothesis could be that there may be greater projection of preferences about minority options (such as pecan pie, chosen by only about 15% of participants) than projection for majority options (such as cheesecake, chosen by 70%). When the prediction task involves three or more options, it is difficult to tease apart, without the support theory framework, the amount of projection for different options simply in terms of the raw differences between, say, P (cheesecake) for cheesecake lovers vs. non-lovers. Because the predictions of the different options are constrained to sum to 100%, a pecan-pie-lover's prediction of cheesecake popularity will be influenced by her inflated estimate of pecan-pie popularity. Hence, the raw judgments are difficult to interpret due to this dependency. With the support theory framework it is possible to separately estimate the degree of projection for each option at the level of support. Future research could test hypotheses about variable degrees of social projection for different types of options, or different expressions of preference.

Managerial implications

Description-dependence and the discounting of less-salient options have not previously been considered as an important contributor to social projection. Practically speaking, this finding suggests that in complex real-life prediction tasks, where multiple options are potentially available, the idiosyncratic framing of the choice options can greatly affect the amount of social projection. In particular, social projection will be most severe when the judge happens to treat his preferred option as focal, and implicitly aggregates together all the many other alternatives. Indeed, this is likely to be a common approach to many preference prediction problems. One often first notices one's preferred option, and then one may consider whether others would like it also. The present findings suggest that such a sequence is a recipe for maximal social projection, and this sequence may frequently arise in managerial contexts in general, and in negotiations in particular.

Managers often have to rely on their intuitive judgments, mostly because they lack more formal information or because available information may be ill-suited to the prediction task at hand. In negotiations, for example, it is critical to accurately assess the other party's preferences in order to trade off losses on less important issues for gains on more important issues, reaching integrative outcomes that enlarge the total pie. Such perfect information is seldom available, however, mainly because parties may be strategically withholding or misrepresenting their actual preferences in order to get additional concessions from their counterparts. In such cases, negotiators may project their own preferences and priorities onto the other party. This approach, however, has been shown to contribute to the common fixed-pie perception that often leads to sub-optimal negotiation outcomes (Bottom & Paese, 1997).

Our findings suggest that discouraging negotiators from focusing on issues that they prefer to settle the most may reduce their tendency to pack together other issues that their counterpart may nevertheless consider important. Providing specific instructions for negotiators to explicitly consider why an issue, even if not a priority for oneself, may be a priority for the other party may reduce the discounting of those less-salient options, potentially enabling parties to better realize the variable-sum nature of the negotiation. Additionally, our findings imply that it may be sensible to explicitly list all issues, even those that may seem initially of low priority for both parties, before the negotiation begins to protect them from being discounted when packed together. Doing so may trigger greater salience for an issue that one party may not personally value highly, but they recognize may be of value to the other party.

Future research

The support theory framework is quite flexible and can accommodate a variety of specific models. In this paper, we have discussed two such models applied to popularity judgments, both centering on variations in unpacking effects (as instantiated in the *w*'s) depending on preferences. However, useful support-based models can be developed outside the context of unpacking. For instance, the support for an option's popularity could be represented in terms of the objective features or attributes of that option, or in terms of its relations to similar options. Support for an option's popularity could also be linked to additional, non-probabilistic judgments, such as the perceived "hedonic strength" of that option for oneself or others (see Brenner et al., 2002; Fox, 1999; Koehler, 1996). Just as utility can be modeled in numerous ways in the domain of choice, support can be modeled in numerous ways in the domain of prediction and belief, and specifically in the domain of predicting others' preferences. The support framework offers numerous possibilities to model beliefs about others in a variety of ways, both related to and expanded beyond social projection.

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