When Imperfect is Preferred: The Differential Effect of Aesthetic Imperfections on Choice of Processed and Unprocessed Foods

Web Appendix

Web Appendix A: Pilot study

We conducted a pilot study to test our basic proposition that consumers are more likely to prefer an imperfect option when choosing between two processed foods than when choosing between two unprocessed foods. Online panelists recruited from the Prolific online research platform (www.prolific.co) (N = 401; 47.4% female, 50.9% male, 1.7% other or preferred not to say; M_{age} = 36.28) viewed a pair of food images randomly drawn from eight sets of foods. Four sets were unprocessed foods (red apples, green apples, tomatoes, carrots) and four sets were processed foods (breads, pizzas, hot dog rolls, cookies). As shown below, each pair of images displayed an aesthetically imperfect and a more aesthetically perfect version of the same food. All food images were images of real foods sourced by searching Google Images for the product category and either perfect or imperfect (e.g., “red apples perfect”). Participants were asked to indicate which of the displayed foods they would prefer to eat by selecting either “Option A” or “Option B” and the presentation order of the perfect and imperfect food options were randomly rotated.

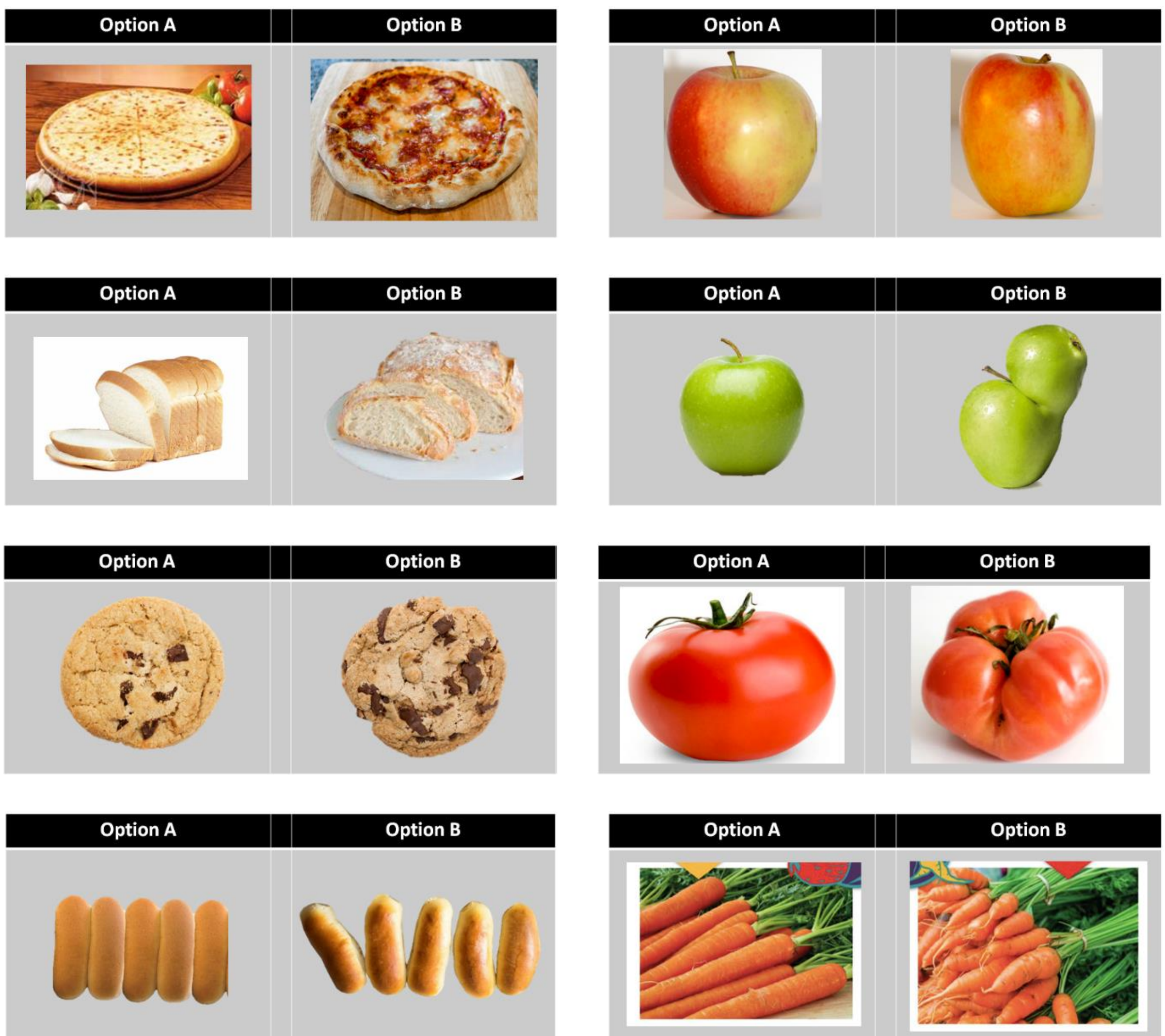
Results

Across all pairs of food images, the results of a chi-square test showed that individuals who viewed a set of processed foods were significantly more likely to choose the imperfect option than individuals who viewed a set of unprocessed foods ($P_{processed}$ = 78.2% vs. $P_{unprocessed}$ = 12.3%; χ^2 = 174.78, p < .001). Consistent with our basic proposition, the majority of individuals preferred the perfect carrots ($P_{perfect}$ = 82.7% vs. $P_{imperfect}$ = 17.3%; χ^2 = 22.23, p < .001), green apple ($P_{perfect}$ = 98.1% vs. $P_{imperfect}$ = 1.9%; χ^2 = 48.08, p < .001), red apple ($P_{perfect}$ = 81.3% vs. $P_{imperfect}$ = 18.8%; χ^2 = 18.75, p < .001), and tomato ($P_{perfect}$ = 88.4% vs. $P_{imperfect}$ = 11.6%; χ^2 = 25.33, p < .001). However, the pattern of preferences reversed when individuals viewed a set of processed foods. The majority of individuals preferred the imperfect bread ($P_{perfect}$ = 16.1% vs.

$P_{imperfect}$ = 83.9%; χ^2 = 28.45, p < .001), buns ($P_{perfect}$ = 29.8% vs. $P_{imperfect}$ = 70.2%; χ^2 = 7.68, p = .006), cookie ($P_{perfect}$ = 15.1% vs. $P_{imperfect}$ = 84.9%; χ^2 = 25.83, p < .001), and pizza ($P_{perfect}$ = 29.6% vs. $P_{imperfect}$ = 70.5%; χ^2 = 7.36, p = .007). Overall, the pattern of results is consistent with our basic proposition that consumers are more likely to prefer an imperfect option when choosing between two processed foods than when choosing between two unprocessed foods.

Pilot study stimuli

Processed Foods **Unprocessed Foods**



Note, the left/right position was counterbalanced and imperfect shown above as “Option B”.

Web Appendix B: Products used in Study 1

Processed food (cookies) (imperfect shown on left)

Unprocessed food (mandarin oranges)

Web Appendix C: Study 2 secondary analysis of overall evaluations

As a pre-registered secondary analysis, we measured participants' overall evaluations of each food box. After indicating their WTP for each food box, participants responded to two items related to overall evaluations: "What is your overall evaluation of the food box from Supplier A (B) pictured above?" (1 = bad, 7 = good) and "Overall, how much do you like the food box from Supplier A (B) pictured above?" (1 = dislike, 7 = like). We averaged the two overall evaluation items for the perfect food boxes ($r = .80$) and the imperfect food boxes ($r = .74$) to create single measures of overall evaluation for each food box.

As in the analysis of WTP, we tested the effect of food processing on participants' overall evaluations of the food boxes using a repeated measures ANOVA with one within-subject factor (items: perfect foods vs. imperfect foods) and one between-subjects factor (food processing: processed vs. unprocessed). In support of H2, there was a significant interaction between items and food processing ($F(1, 287) = 143.28$, $p < .001$) indicating that the effect of aesthetic perfection on participants' overall evaluations for the food boxes depended on food processing. In addition, there was a significant main effect of food aesthetics ($M_{perfect} = 4.33$ vs. $M_{imperfect} = 3.29$; $F(1, 287) = 93.79$, $p < .001$). Follow-up planned contrast tests showed a non-significant difference in overall evaluation for the food boxes in the processed condition ($M_{perfect} = 3.58$ vs. $M_{imperfect} = 3.82$; $F(1, 287) = 2.50$, $p = .115$) and a greater overall evaluation for perfect food box in the unprocessed condition ($M_{perfect} = 5.09$ vs. $M_{imperfect} = 2.75$; $F(1, 287) = 245.50$, $p < .001$). Thus, consistent with our expectations and the WTP analysis, we find a greater overall evaluation of the imperfect (vs. perfect) option for processed as opposed to unprocessed foods.

Web Appendix D: Stimuli creation pretest results

Apple and Applesauce

As compared to the perfect apple, participants evaluated the imperfect apple as less uniform in shape ($M_{imperfect}$ = 2.48; $M_{perfect}$ = 4.31; F (1, 82) = 41.22, $p < .001$), equally uniform in color ($M_{imperfect}$ = 5.22; $M_{perfect}$ = 4.82; F (1, 82) = 1.66, $p = .202$), and equally uniform in texture ($M_{imperfect}$ = 5.18; $M_{perfect}$ = 5.02; F (1, 82) = 0.28, $p = .597$). The effect of processing was non-significant for all measures of expected taste ($p > .10$).

As compared to the perfect applesauce, participants evaluated the imperfect applesauce as less uniform in shape ($M_{imperfect}$ = 3.58; $M_{perfect}$ = 5.77; F (1, 81) = 40.60, $p < .001$), less uniform in color ($M_{imperfect}$ = 5.18; $M_{perfect}$ = 6.10; F (1, 81) = 11.88, $p < .001$), and less uniform in texture ($M_{imperfect}$ = 3.72; $M_{perfect}$ = 6.10; F (1, 81) = 54.64, $p < .001$). The effect of processing was non-significant for all measures of expected taste ($p > .10$) except for a marginally significant difference in expected sweetness ($M_{imperfect}$ = 5.89; $M_{perfect}$ = 5.16; F (1, 81) = 3.89, $p = .052$).

Potato and Fries

As compared to the perfect potato, participants evaluated the imperfect potato as less uniform in shape ($M_{imperfect}$ = 2.83; $M_{perfect}$ = 4.50; F (1, 80) = 31.49, $p < .001$), more uniform in color ($M_{imperfect}$ = 4.98; $M_{perfect}$ = 4.29; F (1, 80) = 4.53, $p = .037$), and equally uniform in texture ($M_{imperfect}$ = 5.03; $M_{perfect}$ = 5.47; F (1, 80) = 2.11, $p = .150$). The effect of processing was non-significant for all measures of expected taste ($p > .10$).

As compared to the perfect fries, participants evaluated the imperfect fries as less uniform in shape ($M_{imperfect}$ = 4.62; $M_{perfect}$ = 6.38; F (1, 84) = 49.42, $p < .001$), less uniform in color ($M_{imperfect}$ = 5.14; $M_{perfect}$ = 6.42; F (1, 84) = 30.83, $p < .001$), and less uniform in texture

($M_{imperfect}$ = 5.02; $M_{perfect}$ = 6.17; F (1, 84) = 20.48, *p* < .001). The effect of processing was non-significant for all measures of expected taste (*p* > .10).

Potato and Chips

As compared to the perfect potato, participants evaluated the imperfect potato as less uniform in shape ($M_{imperfect}$ = 2.77; $M_{perfect}$ = 3.86; F (1, 82) = 12.04, *p* < .001), marginally less uniform in color ($M_{imperfect}$ = 3.58; $M_{perfect}$ = 4.18; F (1, 82) = 3.12, *p* = .081), and less uniform in texture ($M_{imperfect}$ = 3.53; $M_{perfect}$ = 4.52; F (1, 82) = 10.51, *p* = .002). The effect of processing was non-significant for all measures of expected taste (*p* > .10) except for a marginally significant difference in expected bitterness ($M_{imperfect}$ = 2.19; $M_{perfect}$ = 2.81; F (1, 82) = 3.35, *p* = .071).

As compared to the perfect chips, participants evaluated the imperfect chips as less uniform in shape ($M_{imperfect}$ = 4.19; $M_{perfect}$ = 6.53; F (1, 79) = 82.94, *p* < .001), less uniform in color ($M_{imperfect}$ = 5.23; $M_{perfect}$ = 6.56; F (1, 79) = 21.38, *p* < .001), and less uniform in texture ($M_{imperfect}$ = 5.33; $M_{perfect}$ = 6.34; F (1, 79) = 17.46, *p* < .001). The effect of processing was non-significant for all measures of expected taste (*p* > .10).

Web Appendix E: Care manipulations in care pretest and Study 4

"Below you will find some information about how the foods pictured above were produced."

Human Care Information, Unprocessed Food (Imperfect was B)

Food A was planted.	Food B was planted by a human.
Food A was watered.	Food B was watered by a human.
Food A was monitored.	Food B was monitored by a human.
Food A was harvested.	Food B was harvested by a human.
Food A was selected.	Food B was selected by a human.

Machine Care Information, Unprocessed Food (Imperfect was B)

Food A was planted.	Food B was planted by a machine.
Food A was watered.	Food B was watered by a machine.
Food A was monitored.	Food B was monitored by a machine.
Food A was harvested.	Food B was harvested by a machine.
Food A was selected.	Food B was selected by a machine.

Control/None, Unprocessed Food

Food A was planted.	Food B was planted.
Food A was watered.	Food B was watered.
Food A was monitored.	Food B was monitored.
Food A was harvested.	Food B was harvested.
Food A was selected.	Food B was selected.

Human Care, Processed Food (Imperfect was B)

Food A was sourced.	Food B was sourced by a human.
Food A was cleaned.	Food B was cleaned by a human.
Food A was processed.	Food B was processed by a human.
Food A was cooked.	Food B was cooked by a human.
Food A was presented.	Food B was presented by a human.

Machine Care, Processed Food (Imperfect was B)

Food A was sourced.	Food B was sourced by a machine.
Food A was cleaned.	Food B was cleaned by a machine.
Food A was processed.	Food B was processed by a machine.
Food A was cooked.	Food B was cooked by a machine.
Food A was presented.	Food B was presented by a machine.

Control/None, Processed Food

Food A was sourced.	Food B was sourced.
Food A was cleaned.	Food B was cleaned.
Food A was processed.	Food B was processed.
Food A was cooked.	Food B was cooked.
Food A was presented.	Food B was presented.

Web Appendix F: Care pretest

We conducted a pretest to ensure that the manipulations of human care and machine care conveyed the intended information. The pretest had a 3 (care information: human care vs. machine care vs. control/none) x 2 (food processing: processed vs. unprocessed) between-subjects design. Online panelists (N = 181; 48.6% female, 49.2% male, 2.2% preferred not to say; M_{age} = 32.10) were randomly assigned to view a pair of food items. In the processed (unprocessed) food condition, participants viewed the fries (potatoes) from Studies 3a and 4. Then, based on the care condition, the survey displayed information under the food images. Participants in the human and machine care conditions read that the imperfect items received human care or machine care at different steps in the production process. In the control conditions, the steps in the production process appeared without any human care or machine care information. These manipulations are consistent with prior work (Abouab and Gomez 2015). After viewing the pair of food items, participants completed the same measures of human and machine care used in Study 3b.

We coded the human and machine care items so that higher values indicated greater perceived care for the imperfect option. We then created indexes of human care (α = .88) and machine care (α = .89) by averaging the three items pertaining to each.

Human care. An ANOVA with food processing and care information as independent variables on perceived human care revealed only a main effect of care information ($F(2, 175) = 80.07$, $p < .001$). The main effect of food processing ($F(2, 175) = 2.44$, $p = .120$) and the interaction were non-significant ($F(2, 178) = 2.01$, $p = .137$). Thus, we collapsed the food processing conditions. A one-way ANOVA on perceived human care revealed significant differences ($F(2, 178) = 78.43$, $p < .001$). Follow-up tests showed that the imperfect item was perceived as receiving more human care when participants read about human care in the production process as compared to machine care ($M_{human} = 5.28$ vs. $M_{machine} = 2.04$; $F(2, 178) = 156.75$, $p < .001$) or no care information ($M_{control} = 3.59$; $F(2, 178) = 34.99$, $p < .001$).

Machine care. An ANOVA with care information and food processing as independent variables and machine care as the dependent variable revealed only a main effect of care information ($F(2, 175) = 87.47$, $p < .001$). The main effect of food processing ($F(2, 175) = 0.06$, $p = .801$) and the interaction were non-significant ($F(2, 175) = 1.28$, $p = .281$). Thus, we collapsed the food processing conditions. A one-way ANOVA on perceived machine care revealed significant differences ($F(2, 178) = 87.81$, $p < .001$). Follow-up tests showed that the imperfect item was perceived as receiving more machine care when participants read about machine care in the production process as compared to human care ($M_{machine} = 5.69$ vs. $M_{human} = 2.51$; $F(2, 178) = 152.40$, $p < .001$) or the control condition ($M_{control} = 3.01$; $F(2, 178) = 106.19$, $p < .001$).

Web Appendix G: Study 4 replication and posttest

The purpose of the Study 4 replication was to replicate the effects of Study 4 with the apples (unprocessed foods) and applesauce (processed foods) used in Study 3b. The design, procedure, and analysis were identical to that of Study 4 except for the use of apple stimuli for processed and unprocessed foods. Online panelists who did not participate in Study 4 completed the study (N = 300; 45.3% female, 54.4% male, 0.3% preferred not to say; M_{age} = 32.44).

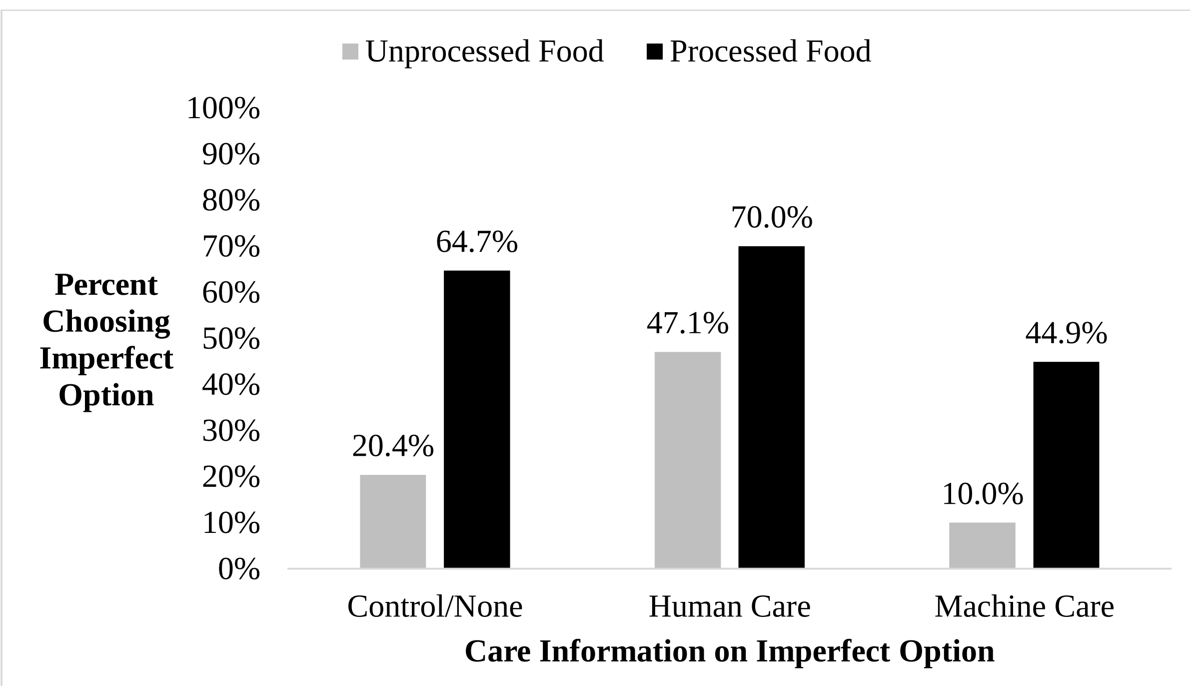
Results

We regressed food choice (1 = imperfect, 0 = perfect) on a contrast-coded variable for food processing (1 = processed, −1 = unprocessed), two dummy coded variables for information on imperfect with the control condition as the reference level, and the two-way interactions between food processing and the information on imperfect dummy codes using a logistic regression.

First, in support of H2 and as illustrated below, we find a positive simple effect of food processing within the control condition ($\beta = 0.98$, $\chi^2(293) = 18.30$, $p < .001$), the human care information condition ($\beta = 0.48$, $\chi^2(293) = 5.35$, $p = .021$), and the machine care information condition ($\beta = 1.00$, $\chi^2(293) = 13.03$, $p < .001$) indicating that there was greater preference for the imperfect (vs. perfect) option with processed foods across all levels of human care.

Next, we find a non-significant interaction between food processing and the human care dummy code ($\beta = -0.50$, $\chi^2(293) = 2.61$, $p = .107$) and, in support of H4, there was a positive main effect of the human care dummy code ($\beta = 0.74$, $\chi^2(293) = 5.72$, $p = .017$). This main effect shows that providing information about the care involved in producing the imperfect option increased preference for that option relative to the perfect option across both levels of food processing. With unprocessed foods, individuals infer lower care in production of the imperfect (vs. perfect) option. Thus, the simple effect showed that providing information on the care involved in producing an imperfect option increased preference for that option compared to no information (P_{human_care} = 47.1% vs. $P_{control}$ = 20.4%; β = 1.24, χ^2 (293) = 7.56, *p* = .006). Human care is inferred to be high for the imperfect processed food, hence the simple effect of care information did not increase preference relative to the no information condition (P_{human_care} = 70.0% vs. $P_{control}$ = 64.7%; β = 0.24, χ^2 (293) = 0.32, *p* = .571).

Finally, we find a non-significant interaction between food processing and the machine care dummy code (β = 0.01, χ^2 (293) = 0.00, *p* = .972) and a negative main effect of the machine care dummy code (β = −0.82, χ^2 (293) = 5.26, *p* = .022). The main effect indicates that, unlike human care which increased preference for the imperfect option, information about the machine care involved in producing the imperfect option decreased preference for that option. The simple effect of machine care as compared to no information showed that machine care did not decrease the already low preference for imperfect unprocessed foods ($P_{machine\_care}$ = 10.0%; β = −0.84, χ^2 (293) = 2.01, *p* = .156), but machine care information did decrease preference for the imperfect processed foods ($P_{machine\_care}$ = 44.9%; β = −0.81, χ^2 (293) = 3.91, *p* = .048).



Posttest

We conducted a posttest to ensure that the perfect and imperfect versions of the stimuli used in the replication study did not vary in terms of calorie content, contamination, freshness, uniqueness, or perceived scarcity. University students (N = 188; 50.5% female, 48.9% male, 0.5% preferred not to say; M_{age} = 21.12) were randomly assigned to view one of four apple-based food items in a 2 (food processing: processed vs. unprocessed) x 2 (aesthetics: perfect vs. imperfect) between subjects design. Participants were then asked to rate the calorie content (1 = low in calories, 7 = high in calories), contamination (1 = not at all dirty, 7 = very dirty) (White et al. 2016), and scarcity (1 = very small supply, 7 = very large supply) (adapted from Eisend 2008) of the food item. To measure perceived freshness, we asked individuals if they thought the food was picked or prepared in the last week (yes/no). To measure perceived uniqueness, we asked individuals to rate the extent to which they agreed with the statement "The food is one of a kind" (1 = strongly disagree, 7 = strongly agree) (Franke and Schreier 2008).

Calorie content. A 2 (food processing) x 2 (aesthetics) ANOVA on perceived calorie content revealed only a main effect of processing that showed that the processed food was perceived as higher in calories than the unprocessed food ($M_{processed}$ = 4.08 vs. $M_{unprocessed}$ = 2.38; F (1, 184) = 64.50, *p* < .001). The main effect of aesthetics (F (1, 184) = 0.41, *p* = .523) and the interaction (F (1, 184) = 0.46, *p* =.499) were non-significant.

Contamination. A 2 (food processing) x 2 (aesthetics) ANOVA on perceived contamination revealed only a main effect of processing that showed that the processed food was perceived as more contaminated than the unprocessed food ($M_{processed}$ = 3.70 vs. $M_{unprocessed}$ = 2.60; F (1, 184) = 22.88, *p* < .001). The main effect of aesthetics (F (1, 184) = 1.54, *p* = .217) and the interaction (F (1, 184) = 0.08, *p* = .775) were non-significant.

Scarcity. A 2 (food processing) x 2 (aesthetics) ANOVA on perceived scarcity revealed a significant interaction ($F(1, 184) = 4.46$, $p = .036$). The main effect of processing ($F(1, 184) = 0.88$, $p = .350$) and the main effect of aesthetics were non-significant ($F(1, 184) = 0.27$, $p = .607$). The interaction showed that participants thought there was a marginally larger supply of perfect as compared to imperfect apples ($M_{perfect} = 3.83$ vs. $M_{imperfect} = 3.02$; $F(1, 184) = 3.49$, $p = .063$), but there was no difference in the supply of applesauce based on aesthetics ($M_{perfect} = 2.89$ vs. $M_{imperfect} = 3.38$; $F(1, 184) = 1.26$, $p = .263$).

Uniqueness. A 2 (food processing) x 2 (aesthetics) ANOVA on perceived uniqueness revealed only a marginally significant interaction ($F(1, 184) = 3.39$, $p = .067$). The main effect of processing ($F(1, 184) = 0.31$, $p = .584$) and the main effect of aesthetics were non-significant ($F(1, 184) = 2.51$, $p = .115$). The interaction showed that individuals perceived the imperfect apple as more one of a kind ($M_{perfect} = 2.32$ vs. $M_{imperfect} = 3.38$; $F(1, 184) = 5.93$, $p = .016$). There was no difference between the perfect and imperfect applesauce ($M_{perfect} = 2.72$ vs. $M_{imperfect} = 2.64$; $F(1, 184) = 0.03$, $p = .857$).

Freshness. A (food processing) x (aesthetics) logistic regression on perceived freshness (1= yes, 0 = no) revealed a main effect of food processing ($\beta = 1.01$, $\chi^2 = 5.56$, $p = .018$), a main effect of aesthetics ($\beta = -1.93$, $\chi^2 = 10.25$, $p = .001$) and a significant interaction ($\beta = 2.06$, $\chi^2 = 7.70$, $p = .006$). The interaction showed there was no difference in the proportion of individuals who said the apples were fresh based on aesthetics ($P_{imperfect} = 66.7\%$ vs. $P_{perfect} = 63.8\%$; $\chi^2 = 0.08$, $p = .772$). Individuals who viewed the perfect apple sauce were more likely to rate it as fresh than individuals who viewed the imperfect apple sauce ($P_{imperfect} = 8.5\%$ vs. $P_{perfect} = 39.1\%$; $\chi^2 = 12.07$, $p = .001$).

Web Appendix H: Human carelessness manipulation in Study 4

"Below you will find some information about how the foods pictured above were produced."

Human carelessness manipulation, unprocessed food (imperfect is B)

Food A was planted.	Food B was carelessly planted by a human.
Food A was watered.	Food B was carelessly watered by a human.
Food A was monitored.	Food B was carelessly monitored by a human.
Food A was harvested.	Food B was carelessly harvested by a human.
Food A was selected.	Food B was carelessly selected by a human.

Human carelessness manipulation, processed food (imperfect is B)

Food A was sourced.	Food B was carelessly sourced by a human.
Food A was cleaned.	Food B was carelessly cleaned by a human.
Food A was processed.	Food B was carelessly processed by a human.
Food A was cooked.	Food B was carelessly cooked by a human.
Food A was presented.	Food B was carelessly presented by a human.

Web Appendix References

Eisend, M. (2008). Explaining the impact of scarcity appeals in advertising: The mediating role of perceptions of susceptibility. *Journal of Advertising*, *37*, 33–40.

Franke, N., & Schreier, M. (2008). Product uniqueness as a driver of customer utility in mass customization. *Marketing Letters*, *19*, 93–107.