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Something underneath? Using a within-subjects design to examine schema congruity theory at an individual level

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ABSTRACT

Previous research has shown that perceived incongruity affects product evaluations in an inverted U shape. However, it remains unclear whether this relation also occurs at individual levels with continuous incongruity measures, and for products with repurposed materials. Five within-subjects studies do not show the inverted U relation across all participants. Instead, consumer subgroups show a monotonic relation: higher congruity leads to higher product evaluations. This aligns with processing fluency theory. Additionally, we demonstrate that the degree of processing from raw to end materials and the extent to which materials fulfil product functions mediate the effect of repurposed materials on perceived incongruity.

1. Introduction

The success of a new product can depend on the degree to which consumers perceive the product to be incongruent with their expectations. The well-known "MAYA" (Most Advanced, Yet Acceptable) principle from Raymond Loewy (1950s) suggests that an inverted U shape relation exists between product incongruity and product evaluations: consumers can easily get bored with new products that are congruent with their expectations, but they can also reject products that are too incongruent with their expectations. Therefore, consumers would mostly prefer new products that are moderately incongruent. This inverted U shape relation between perceived incongruity and product evaluation has been explained by schema congruity theory (Mandler, 1982), and over the years many studies have supported the idea of an inverted U shape relation between product incongruity and product evaluation (Campbelland Goodstein, 2001; Jhang et al., 2012; Maoz and Tybout, 2002; Meyers-Levy and Tybout, 1989; Noseworthy et al., 2014).

However, these existing studies have almost exclusively examined this inverted U shape relation at an average level across consumers by comparing three categories of product incongruity: congruent products, moderately incongruent products, and extremely incongruent products. Even though schema congruity theory predicts the inverted U shape to occur at an individual consumer level, because of the group average based approach to date, it has not been directly examined whether this actually occurs at the individual level. The knowledge gap in investigating the effect of perceived incongruity on product evaluation at the individual level leads, in our view, to a lack of precision in understanding schema congruity theory.

The current research is the first to examine the effect of perceived incongruity on product evaluation at an individual consumer level in a new retailing context. Currently, increasingly many retailers introduce new products with natural, repurposed materials as alternatives for sustainability considerations. Such "repurposing" concern the change of using products or materials for their conventional use to using products or materials for a new use (Bridgens et al., 2018; Kamleitner et al., 2019). In most cases, conventional materials are replaced by natural or more sustainable materials, such as repurposed pineapple leaves as alternative to leather, or plastic bottles as raw material for T-shirt fabrics. Repurposed materials may be discrepant from consumers' existing product schemas, and may thereby generate perceived incongruity. Our research examines whether different conventional and repurposed materials evoke various degrees of perceived incongruity and examines the reasons why these materials evoke incongruity perceptions. By studying the relation between incongruity perceptions and evaluations of products with different materials, our findings may also aid retailers to adjust their selections of products with different repurposed materials, and thereby to positively affect the path that leads to increased sales and sustainability.

2. Theoretical framework and hypotheses

Consumer researchers have been studying the relation between

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incongruity in products and product evaluations mostly in retail contexts (Ketron and Spears, 2020; Lee et al., 2020; Mitchell and Balabanis, 2021; Taylor and Noseworthy, 2020). Incongruity of a product can be defined as the degree of perceived discrepancy between that product and an activated schema in a consumer's mind (Meyers-Levy and Tybout, 1989). A schema is a stored framework that contains information about product categories, such as product attributes and their links with each other, and prototypic exemplars (Fiske and Linville, 1980).

Schema congruity theory predicts an inverted U shape relation between perceived incongruity and product evaluation: moving from products that are perceived as congruent to products that are perceived as incongruent, consumer evaluations first increase and then decrease (Mandler, 1982; Meyers-Levy and Tybout, 1989). Specifically, when consumers perceive the product to be congruent with their schema, consumers evaluate the product mildly positive, because consumers like their expectations to be confirmed. Incongruent products are more noteworthy than congruent products, and thus evoke more cognitive elaboration (Peracchio and Tybout, 1996). Successfully resolving such incongruity can lead to positive affect, such as curiosity and interest (Berlyne, 1966; Mandler, 1982; Noseworthy et al., 2014). However, when consumers perceive too much incongruity in products, understanding the product can be elusive to consumers, even after deliberation (Mandler, 1982; Peracchio and Tybout, 1996). Such resolution failure can lead to negative affect, such as anxiety and frustration. These affective states can subsequently be contributed to the product evaluation (Mandler, 1982; Meyers-Levy and Tybout, 1989; Noseworthy et al., 2014). For example, Jhang et al., (2012) used three types of drinks to represent the incongruity levels: vitamin-fortified orange juice (highly congruent), vitamin-fortified coffee (moderately incongruent), and vitamin-fortified vodka (highly incongruent). The authors argued that vitamin-fortified juice confirmed consumer expectations, thereby leading to mildly positive product evaluations. Consumers were able to resolve the incongruity in vitamin-fortified coffee, leading to an even more positive evaluation. Finally, consumers were not able to make sense of vitamin-fortified vodka, thereby leading to lower product evaluations (see Fig. 1).

As in the research of Jhang et al., (2012), the commonly adopted approach to examine the inverted U shape is to first select products that represent the three categories of incongruity (congruent, moderately incongruent, and extremely incongruent; the three grey areas in Fig. 1), and then to conduct between-subjects experiments to compare the average evaluations of these products across consumers (Maoz and Tybout, 2002; Meyers-Levy et al., 1994; Meyers-Levy and Tybout, 1989; Noseworthy and Trudel, 2011). In our view, this approach has three disadvantages. First, schema congruity theory posits that it is consumers' incongruity perceptions, and not the incongruity itself, that affects product evaluation. These incongruity perceptions can vary from completely congruent to completely incongruent, resulting in a continuous variable that causes the inverted U shape in product evaluations

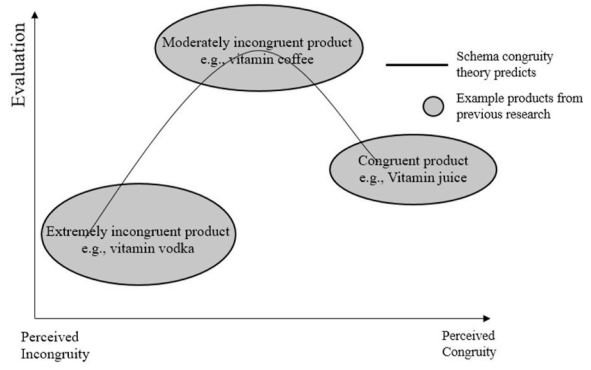

Fig. 1. Difference between the theory prediction and findings of previous research.

(the line in Fig. 1). The existing approach to date has only used three categories of stimuli and within each category incongruity is assumed to be equal for all participants (the grey areas in Fig. 1). Then the evaluations of these three groups incongruity are compared, leading to conclusions about the incongruity and product evaluation of these three groups.

Second, the precise level of incongruity that maximizes product evaluation (the top of the inverted U shape) cannot be estimated when using the pre-determined moderately incongruent products. A more precise estimation of the 'optimal' level of incongruity would increase the precision of the theory's prediction, which might also help product designers to decide how much "advanced" design can be put into the product.

Finally, the theory predicts the inverted U shape to occur within individual consumers. However, the between-subjects approach makes it impossible to learn how changes in incongruity perceptions affect changes in product evaluations for individual consumers. In a between-subjects design, each consumer evaluates only one product. Instead, the use of within-subjects designs would make it possible to examine whether the inverted U shape also occurs within individual consumers. In such a within-subjects design, each consumer evaluates multiple products. This would also make it possible to study individual differences and to identify potential subgroups who are sensitive to the effects of perceived incongruity on product evaluation. Identifying subgroups is particularly relevant when the entire sample presents a null effect. Null effects can be caused by either (1) the absence of an effect in the population, or by (2) the existence of opposite effects in different subgroups, which balance each other out (Miller and Schwarz, 2017). It is, therefore, theoretically valuable to determine whether the effect of incongruity perceptions on product evaluations exists at the individual level. Moreover, the existence of subgroups of consumers may aid retailers to target consumer subgroups. By adopting continuous incongruity perception measures and within-subjects designs, the present research aims to advance the understanding of schema congruity theory. We first aimed to replicate the schema congruity hypothesis concerning the inverted U shape at the average level (i.e., across all consumers):

H1. There is an inverted U shape relation between perceived incongruity and product evaluation on average across all consumers.

After establishing the average effect for perceived incongruity on product evaluations, we aimed to explore whether the effect would also occur at an individual consumer level by clustering consumers into subgroups.

To induce incongruity perceptions in a realistic marketing setting, we selected products made of repurposed and of conventional materials. We expected that repurposed materials would have a stronger mismatch with consumers' product category schemas, and thus would induce more incongruity perceptions than conventional materials. Repurposed materials can be either natural (e.g., pineapple leaves) or artificial (e.g., plastic bottles), which might also influence incongruity perceptions. Therefore, we added naturalness as another dimension in materials to explore the effect of naturalness and the interaction between repurposing and naturalness on perceived incongruity. Thus:

H2. Repurposed materials are perceived as less congruent than conventional materials.

Two reasons why repurposed materials could be perceived as less congruent than conventional materials were examined. One reason could be that consumers perceive repurposed materials as failing to serve the products' primary function. For example, consumers may wonder whether pineapple leaves would be sturdy enough to be materials of backpacks. The function of an object is crucial for people to determine which category the object belongs to (Malt and Johnson, 1992). Previous research suggests that when being confronted with new products, consumers' priority is to understand the function(s) of the products (Kivetz and Simonson, 2002; Noseworthy and Trudel, 2011). Thus, when materials are perceived to fail the product function,

consumers may consider the product to be less congruent. Second, repurposed materials or products often undergo substantial transformations to be suitable for new use (Wilson, 2016; Winterich et al., 2019). For example, the "cottonizing" of bamboo is required for the creation of soft fabrics. We argue that the more steps required in the transformation process to change raw materials into final materials will, the less congruity consumers perceive. Therefore, we hypothesized:

H3a. Lower perceived congruity of repurposed compared to conventional materials is caused by lower product function perceptions of materials.

H3b. Lower perceived congruity of repurposed compared to conventional materials is caused by more perceived processing steps that raw materials need for being transferred to final materials.

We pre-registered the planned sample sizes, analyses, and hypotheses of all studies.[1]

3. Study 1

Study 1 examined whether various materials generated different levels of perceived incongruity, and the relation between perceived incongruity and product evaluation. This was tested in two studies (1a and 1b) that only differed in the type of products used (Table 1).

3.1. Method

Participants and Design. The studies had 2 (Naturalness: natural vs. artificial) × 2 (Repurpose: repurposed vs. conventional) within-subjects designs. For each condition, we included two products made by two materials. Each participant was presented with eight products made from eight materials in a random order. The product-material combinations were selected through a Latin-square randomisation from 64 unique product-material combinations.

The current research operationalized perceived incongruity as a continuous predictor. Previous research operationalized incongruity as a categorical predictor (e.g., Meyers-Levy and Tybout, 1989; Maoz and Tybout, 2002; Noseworthy and Trudel, 2011). Therefore, the effect sizes from previous studies could not be used to calculate the required sample sizes for the current research. To ensure that each of 64 product-material combinations had at least 20 responses, we planned to collect 160 (20 × 8) participants. We eventually collected 165 participants for study 1a (M_{age} = 33.8, SD_{age} = 9.3, 66% female), and 161 participants for study 1b (M_{age} = 33.7, SD_{age} = 10.5, 71% female). Participants in both studies were UK residents recruited from the online platform Prolific for monetary compensation.

Products. The backpack (1a) and shoe (1b) pictures were selected based on two criteria: (1) the products were aesthetically non-unique; (2) the materials used for the products were vague to identify (See all the product pictures in Appendix A).

Materials. Twenty-two materials were pretested on their natural and repurposing levels when being used for backpacks or shoes.[2] The eight materials varying most on the naturalness and repurposing levels were subsequently selected (Table 1).

Procedure and measurements. The studies were implemented through the online experiment platform Gorilla (https://gorilla.sc/). First, participants evaluated each of the eight backpacks (1a)/shoes (1b) without information about the product materials on a single liking rating item adapted from Güçlütürk et al., (2016). Then participants evaluated how much they liked each of eight materials being used for backpacks (1a)/shoes (1b) on the same item. Participants subsequently were again shown each product picture, but this time each picture was accompanied by a text description of the material (e.g., "This backpack is made of pineapple leaves"). For each product with the material description, participants first assessed perceived incongruity of the material used for the product by answering the item "how typical/usual do you think e.g., pineapple leaves are used as material for this backpack?". This item was adapted from a two-item scale for incongruity (Jhang et al., 2012). Finally, participants again evaluated on the single-item measure how much they liked each product with the material description. All items were rated on a 100-point measure, ranging from 1 (not at all) to 100 (very much), with a starting point of 50.

3.2. Analyses

The effect of repurpose and naturalness on perceived incongruity was examined with multilevel linear regressions in a Bayesian framework using the R-*brms* package (Bürkner, 2017).[3] Repurposing, naturalness, and the interaction were the predictors, and perceived incongruity was the outcome.[4] Posterior distributions of slope estimations were reported as results. When 95% credible intervals did not include 0, we claimed the corresponding predictor to be statistically meaningful.

The inverted u shape relation between incongruity and evaluation was examined using a two-lines method with Robin Hood algorithm (Simonsohn, 2018). Compared with the commonly used quadratic regression method, the two-lines method has a higher power and lower false positive rate to detect (inverted) U shape relations. A breakpoint was first identified to separate (in)congruity into two parts along the x-axis, ranging from low congruity to high congruity: low congruity on the left side and high congruity on the right side, according to its linear regression on product evaluation. We claimed the inverted U shape to be present at the average level across all participants when the left slope was positive, and when the right slope was negative. The Robin Hood algorithm moves observations from the more powerful line to the less powerful one. The two-lines method was conducted with the interrupted multilevel linear regression.

To explore whether subgroups existed, we extracted individual left and right slope values from each individual, then plotted these values as a two-dimension contour map. We conducted k-means cluster analyses on slope values to identify subgroups in which participants might show clear patterns. The number of optimal clusters was determined by the elbow plot and average silhouette; combined with the decision to keep the cluster number consistent across all five studies in this paper if at all reasonable. Combining these criteria resulted in the identification of two clusters in all studies. When the inverted U shape was shown in one cluster, then, within this cluster, the majority of left slopes should be positive and the majority of right slopes should be negative.

3.3. Results and discussion

Both studies showed a main effect of repurposing on perceived incongruity: repurposed materials were perceived as being less congruent than conventional materials, β_{1a} = −40.95, SE_{1a} = 2.70, 95%CI [−46.14, −35.46]; β_{1b} = −46.69, SE_{1b} = 2.70, 95%CI [−52.01, −41.47]. There was also a main effect of naturalness on perceived

[1] The pre-registration on Open Science Framework: https://osf.io/w7c94/?view_only=1b30bfc2d7f7486dba98d7b724a7662e. The full data set and analysis script are available in the DANS repository: https://doi.org/10.17026/dans-xfv-46ea.

[2] The results of the two pre-tests (1a, 3a) are available on "pretest data and results" section via the OSF link.

[3] In the pre-registration, we planned to analyse the multilevel model using the R-lme4 package. However, when conducting the maximal random-effects structure in the multilevel model to yield conservative conclusions (Barr et al., 2013), our model failed to converge. To avoid this issue and to keep our model consistent throughout the five studies, we conducted multilevel model in Bayesian framework (Nalborczyk et al., 2019).

[4] All specific models are available on "processed data and analysis script" section via the OSF link.

Table 1
Products and materials used in all studies.

Study	Product	Repurposed Natural Material	Repurposed Artificial Material	Conventional Natural Material	Conventional Artificial Material
1, 2	Backpacks (1a, 2); shoes (1b)	Pineapple Leaves; Mushroom	Plastic Bottles; Seat belts	Cotton; Leather	Suede; Nylon
3a, 3b	t-shirts	Seaweed; Nettle	Plastic Bottles; Parachutes	Linen; Silk (3a); Cotton (3b);	Polyester; Nylon

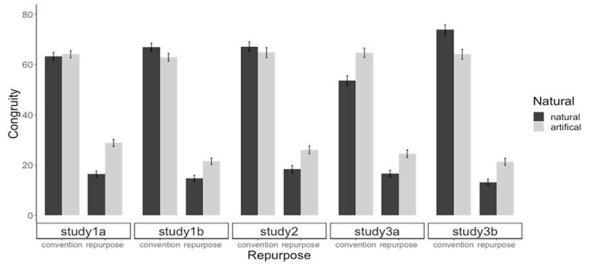

Fig. 2. The effect of repurposing and naturalness on perceived incongruity for all studies.

incongruity in Study 1a: natural materials were perceived as being less congruent than artificial materials, $\beta_{1a} = -6.60$, $SE_{1a} = 2.31$, 95%CI [−11.25, −2.15]; but not in 1b, $\beta_{1b} = -1.41$, $SE_{1b} = 2.32$, 95%CI [−5.92, 3.13]. The interaction effect was found in both studies, $\beta_{1a} = -11.44$, $SE_{1a} = 4.59$, 95%CI [−20.51, −2.17]; $\beta_{1b} = -10.76$, $SE_{1b} = 4.52$, 95%CI [−19.67, −1.95]. Natural repurposed materials were perceived as being the least congruent (Fig. 2).

The interrupted regression generated two slopes (left and right) reflecting how perceived incongruity (from low to high congruity) predicted product evaluation at the average level across all participants. In 1a, the left and right slope were flat across all participants (Table 2). At the individual level, cluster analysis showed that cluster 1 (n = 108) had 53% of the left slopes positive and 82% of the right slopes negative; cluster 2 (n = 57) had all left slopes positive and 11% of the right slopes negative (Fig. 3A). In 1b, the average left and right slopes were flat across all participants (Table 2). Cluster 1 (n = 51) had 0% of the left slope positive, and 63% of the right slopes negative; in cluster 2 (n = 110), 70% of the left slopes were positive and 21% of the right slopes were negative (Fig. 3B, and Table 3).

In sum, we found both studies show a main effect of repurposing and an interaction effect between repurposing and naturalness on perceived incongruity. The inverted U shape relation between incongruity perceptions and product evaluations did not appear at the average level across all participants. At the individual level, both studies showed that cluster 2 had the majority of left and right slopes positive. This reflects a monotonic increasing relation: higher perceived congruity predicts higher product evaluation. Before drawing any inferences, these findings should first be replicated.

4. Study 2

Study 2 aimed to replicate the results of repurposing and naturalness on perceived incongruity. It also examined the inverted U shape between perceived incongruity and product evaluation with a variation on the dependent variable. Moreover, we explored two potential mediators of the main and interaction effects on perceived incongruity. The procedure and stimuli were identical to Study 1a, except that: (1) participants indicated their willingness to pay for products, instead of product liking; (2) measurements for two mediators were added: perceived product function in materials and processing steps from raw to end materials.

4.1. Method

We planned to recruit 100 participants. Eventually 103 were recruited ($M_{age} = 36.1$, $SD_{age} = 11.8$, 63% female). Participants indicated their willingness to pay by answering the item "how much are you willing to pay for this bag? Consider the average price of a backpack is £30-£40". The answers were given by moving the slider on a bar ranging from 0 to 100£, with the default starting point of the slide at 35£. At end of the study, material sturdiness (as a proxy for the function of backpacks) and processing steps were rated for the eight materials. Participants were instructed to drag a slider along the bar (starting point 50) from fragile (1) to sturdy (100) and from few (1) to many steps (100) in a 100-point scale for each material (i.e., "please compare the sturdiness of each material for making backpacks"; "please compare how many steps it takes to process each material for making backpacks").

4.2. Results and discussion

Similar to study 1, results showed the main effect of repurposing on perceived incongruity, $\beta = -43.85$, SE = 3.20, 95%CI [−50.17, −37.65]. There was also an interaction between repurposing and naturalness, $\beta = -10.10$, SE = 4.56, 95%CI [−18.86, −1.02]. There was no main effect of naturalness, $\beta = -2.71$, SE = 2.32, 95%CI [−7.28, 1.84]. Natural repurposed materials were perceived as being the least congruent (Fig. 2).

We conducted two mediation analyses with the mediators processing steps and sturdiness: one for the main effect of repurposing on perceived incongruity, and one for the interaction effect of repurposing and naturalness on perceived incongruity. We applied Baron and Kenny's three-step approach (Baron and Kenny, 1986) adapted to a Bayesian

Table 2
The average level relation between incongruity and product evaluation from the within-subjects data.

Study	Left slope	SE	95%CI	Centred break point	Right slope	SE	95%CI
1a	0.09	0.05	−0.01, 0.19	8.63	−0.01	0.06	−0.12, 0.12
1b	−0.03	0.08	−0.18, 0.12	−4.13	0.03	0.05	−0.06, 0.12
2	0.11	0.04	0.03, 0.20	7.63	−0.04	0.05	−0.13, 0.05
3a	0.09	0.16	−0.32, 0.41	−15.69	0.20	0.06	0.09, 0.32
3b	0.17	0.08	0.02, 0.33	9.75	0.04	0.09	−0.13, 0.21

Note: Posterior distribution means, standard errors, and 95% credible intervals of slope coefficients on left and right side of the centred break point are presented.

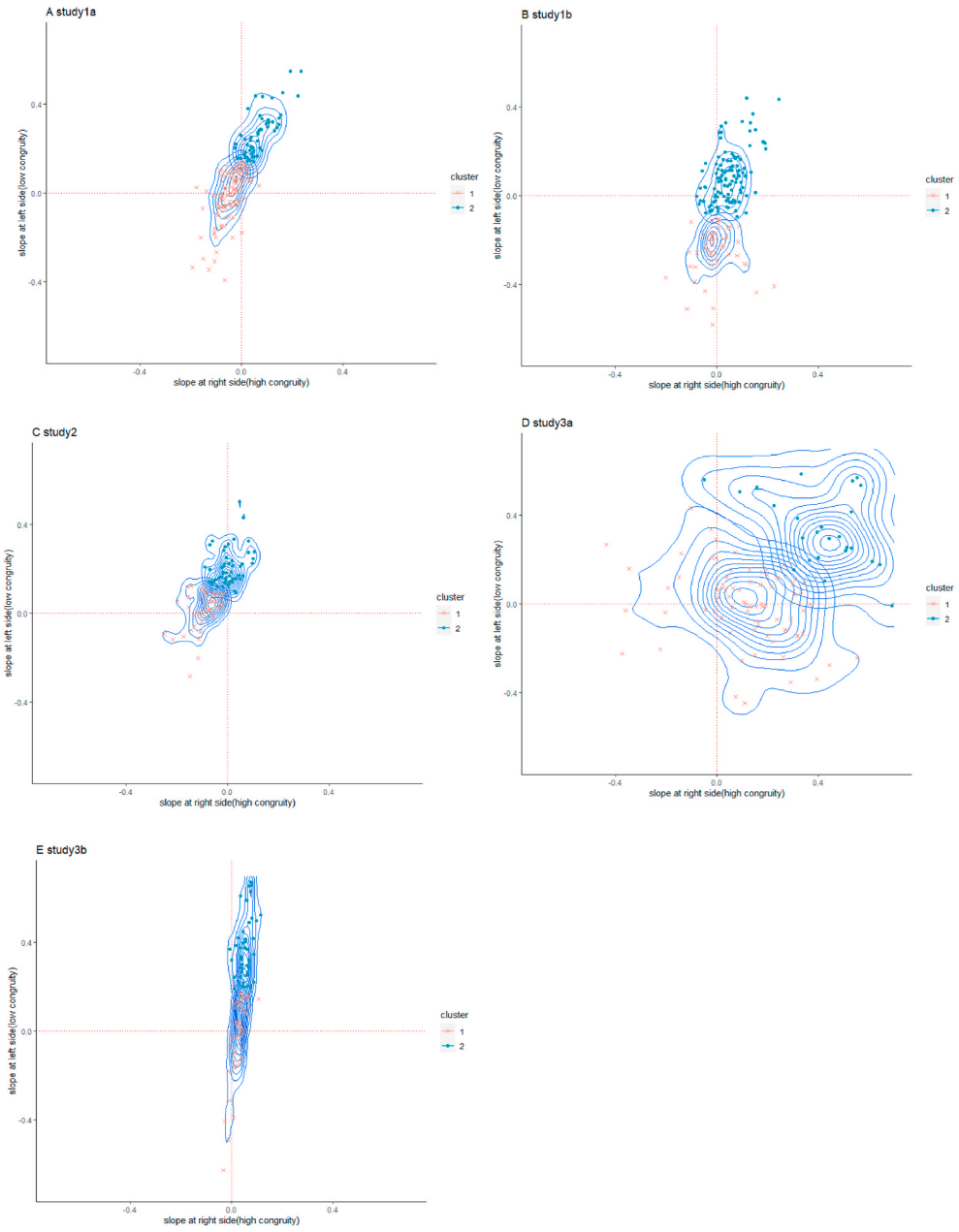

Fig. 3. The left and right slope distributions in two-dimension maps for all studies.

Table 3
Cluster analyses on individual slopes.

Study	$N_{cluster1}$	Positive left slopes (%)	Negative right slopes (%)	$N_{cluster2}$	Positive left slopes (%)	Negative right slopes (%)
1a	108	53%	82%	57	100%	11%
1b	51	0	63%	110	70%	21%
2	50	70%	100%	53	100%	49%
3a	76	51%	20%	28	96%	4%
3b	53	55%	17%	48	100%	4%

Note: In every study, each cluster's number of participants, the percentage of participants with positive signs for the left slopes, and the percentage of participants with negative signs for the right slopes are listed.

Table 4
Mediators of the main effect of repurposing on congruity.

Study	Coefficient posterior distribution	Softness indirect effect	Sturdiness (s2) Durability (s3) indirect effect	Processing steps indirect effect	Direct effect	Total effect
2	Median	–	−2.41	−2.70	−38.59	−43.85
	2.5%	–	−7.34	−6.07	−45.19	−50.17
	97.5%	–	1.95	−0.44	−32.18	−37.65
3a	Median	−2.91	−2.89	−0.31	−31.97	−38.70
	2.5%	−5.69	−7.39	−2.22	−37.22	−44.57
	97.5%	−0.69	1.33	1.06	−26.77	−32.90
3b	Median	−3.25	−1.28	−0.27	−46.60	−51.62
	2.5%	−6.34	−3.88	−2.20	−53.49	−58.15
	97.5%	−1.01	0.95	1.40	−39.58	−44.99

Note: The median, the 2.5th percentile, and the 97.5th percentile of the posterior distribution of each indirect effect, direct effect, and total effect are reported.

framework. We first regressed the mediators (processing steps and sturdiness) on the independent variable (repurposing condition) to calculate the posterior distribution of the coefficient α (i.e., path a). Second, we regressed the dependent variable (perceived incongruity) on the independent variable (i.e., the total effect). Third, we regressed the dependent variable on both the independent variable and on the mediators to calculate the posterior distribution of the coefficient β (i.e., path b). The mediation effect was calculated by multiplying each α and β sampling from their posterior distributions with 12,000 samples (Yuan and MacKinnon, 2009; Zhao et al., 2010). The medians and 95% credible intervals of the indirect effects, the direct effect, and the total effect were reported in Table 4. The results showed that the main effect of repurposing on perceived incongruity was partially mediated by processing steps, but not by sturdiness. Thus, the more processing steps were perceived as needed to transform materials, the less congruent participants perceived the materials to be. The interaction effect was neither mediated by processing steps nor by sturdiness.

The results of testing the inverted U shape between perceived incongruity and product evaluation showed that the average left slope was positive, and the right slope was flat across all participants (Table 2). At the individual level, cluster 1 (n = 50) showed that 70% of the left slopes were positive, and that all right slopes were negative; cluster 2 (n = 53) showed that all left slopes were positive, and that 49% of the right slopes were negative (Fig. 3C, and Table 3).

In sum, study 1 and 2 showed a main effect of repurposing and an interaction effect between repurposing and naturalness on perceived incongruity. These findings suggest that using repurposed materials in a product, and especially using natural, repurposed materials in a product, can negatively affect consumers' perceptions of congruity of the product. At the same time, the main effect of naturalness on perceived incongruity varied across studies and was smaller than the other two effects. Therefore, we refrain from interpreting this effect. The main effect of repurposing was partially explained by processing steps, but not by perceived sturdiness of the used materials. In other words, the longer the processing steps from raw to end materials, the less congruent consumers perceived the materials to be.

With the concept of sturdiness, we aimed to examine the role of the perceived function of the product. However, it is possible that consumers did not view sturdiness as an essential backpack function. Therefore, in the next study we pretested consumers' perceptions of the essential functions of the studied products.

Similar to study 1, study 2 did not reveal the inverted U shape between perceived incongruity and product evaluations at the average level across all participants. At the individual level, cluster 2 in study 2 did not replicate the monotonic increasing relation found in study 1. Cluster 1 in study 2 did show an inverted U shape relation in the majority of the slopes. To further examine the robustness of the slope tendencies in the consumer subgroups, study 3 again tested different products and materials.

5. Study 3

Study 3 aimed to replicate the mediation of processing steps of the effect of repurposing on perceived incongruity. It also aimed to replicate the subgroup patterns found for the relation between perceived incongruity and product evaluations. Instead of backpacks and shoes used in study 1 and 2, study 3 used T-shirts as products. Two studies (3a and 3b) were conducted, which only differed in one material in the natural, non-repurposed condition (Table 1).

5.1. Procedure

We recruited 105 participants in 3a (M_{age} = 36.1, SD_{age} = 11.4, 61% female), and 101 in 3b (M_{age} = 35.0, SD_{age} = 11.1, 70% female). The procedure was identical to study 2, except that study 3 used product liking as the dependent measure (similar to study 1). Since study 3 used T-shirts as products, commensurate materials were also changed (Table 1). A pre-test was conducted to select the essential functions of T-shirts from consumers' perspectives. The four most importantly rated functions were included in study 3: durable, soft, washable, and breathable. A PCA with varimax on these four functions showed that two factors explained 72.68% (3a) and 75.26% (3b) of the variance. Factor 1 consisted of breathability and softness (labelled "softness"). Factor 2 consisted of durability and washability (labelled "durability"). Mediation analyses were conducted by using the average scores of "softness" and of "durability" items as the mediators.

5.2. Results and discussions

Again, we found the main effect of repurposing on perceived incongruity in both studies, β_{3a} = −38.70, SE_{3a} = 2.92, 95%CI [−44.57, −32.90], β_{3b} = −51.62, SE_{3b} = 3.34, 95%CI [−58.15, −44.99]. There was a main effect of naturalness in 3a, β_{3a} = −9.38, SE_{3a} = 2.31, 95%CI [−13.97, −4.89], but not in 3b, β_{3b} = 0.81, SE_{3b} = 2.94, 95%CI [−4.94, 6.63]. There was no interaction in 3a, β = 3.05, SE = 4.63, 95%CI [−6.15, 12.08], but there was an interaction in 3b, β_{3b} = −17.81, SE_{3b} = 6.30, 95%CI [−29.96, −5.50] (Fig. 2). Since the only difference between 3a and 3b was one material changing from silk (3a) to cotton (3b) in the conventional-natural condition, we speculated that the presence and absence of the naturalness main effect and of the interaction were sensitive to material selections. Therefore, we did not further analyse or explain these two effects, nor conduct related mediation analyses on these effects.

Mediation analysis was conducted on the main effect of repurposing on perceived incongruity. Softness, durability, and processing steps were included as mediators. We followed the same procedure as in study

2. The results showed that softness mediated the main effect of repurposing on perceived incongruity in studies 3a and 3b: the less a material was perceived as soft, the less congruent participants perceived the material to be. Processing steps and durability did not mediate the main effect of repurposing on perceived incongruity in 3a nor 3b (Table 4).

The two-lines method again examined how perceived incongruity predicted product evaluation at the average level across all participants. In 3a, the average left slope was flat, and the right slope was positive (Table 2). At the individual level, cluster 1 (n = 77) showed that 51% of the left slopes were positive, and 20% of the right slopes were negative; cluster 2 (n = 28) showed that 96% of the left slopes were positive and 4% of the right slopes were negative (Fig. 3D). In 3b, the average left slope across all participants was positive and the right slope was flat (Table 2). Cluster 1 (n = 53) showed that 55% of the left slopes were positive, and 17% of the right slopes were negative; cluster 2 (n = 48) showed that all left slopes were positive, and that 4% of the right slopes were negative (Fig. 3E, and Table 3). In both 3a and 3b, we found the monotonic increasing relation in cluster 2.

Study 3 again confirmed the effect of repurposing on perceived incongruity, and revealed that this effect was mediated by product function softness in T-shirts. The inverted U shape relation between incongruity perceptions and product evaluation did not appear at the average level across all participants. At the individual level, both studies (3a and 3b) showed that cluster 2 had most left and right slopes positive. This reflects a monotonic increasing relation: higher perceived congruity leads to higher product evaluation, similar to study 1.

6. General discussion

To provide more precise evidence for schema congruity theory, the current research applied a new approach to identify the inverted U shape relation between perceived incongruity and product evaluation. We examined whether incongruity perceptions, instead of groups of products with pre-determined incongruity, relate to product evaluations for individual consumers. The current findings do not support schema congruity theory. None of our studies showed the inverted U shape relation between perceived incongruity and product evaluation. Our findings do consistently show a subgroup of consumers for which higher perceived congruity leads to higher product evaluations.

Besides presenting a new way to examine schema congruity theory, we also investigated whether using repurposed materials in products can generate incongruity perceptions compared to using conventional materials. Moreover, we examined the reasons why consumers would perceive repurposed materials as incongruent. In line with our predictions, the findings revealed that consumers perceive repurposed materials to be more incongruent than conventional materials. Consumers tend to perceive repurposed materials as more incongruent, because more processing steps are perceived to be required to integrate the repurposed materials in the product (study 2), and because such products are perceived as being less able to fulfil the main function of the product (study 3).

6.1. Theoretical implications

Before drawing theoretical implications from not replicating the inverted U shape relation between perceived incongruity and product evaluation found in previous research, we first reflect on two methodological alternative explanations for this null effect.

A first alternative explanation can be that the null effect at the average level across all participants is caused by the within-subjects design. In a within-subjects design, every participant assesses multiple products. Consequently, the perceived incongruity of one product may have influenced the perceived incongruity level of the next product. Although we have limited this influence by counterbalancing the presentation order of the products, it is possible that perceived incongruity of one product may have been influenced by a series of prior congruent and incongruent products. To exclude this alternative explanation, we analyzed the response to the first presented product for every participant. This data approximates a between-subjects design in which participants would see only one (in)congruent product. We found no evidence in any of our five studies for a relation between incongruity perceptions and product evaluations for the first presented products (see Table 4 in Appendix B). There are thus no indications for the alternative explanation that the within-subjects design has caused the null effect at the average level across participants.

The second explanation for the non-replication of the inverted U shape can be that the current products did not induce enough variance in incongruity perceptions to test the inverted U shape relation between incongruity perceptions and product evaluations. To examine this, we plotted the distribution of (in)congruity perceptions across the five studies, and found that centred perception in all studies covered the complete range, from low congruent to high congruent (Fig. 4 in Appendix C). This additional analysis shows that the null effect at the average level across participants was unlikely to be caused by a low variance in perceived (in)congruity. Without any evidence for these two methodological alternative explanations, we continue to interpret the theoretical implications of our findings.

According to schema congruity theory, resolving the puzzle of moderate levels of incongruity would lead to positive affect, and would therefore lead to positive product evaluations. Instead, our finding reveals that at least one subgroup of consumers (cluster 2 in 4 out of 5 studies) consistently evaluates congruent products as more positive than incongruent products. Such a preference for congruent products over incongruent products is in line with processing fluency theory (Reber et al., 2004). In general, congruent products are easier for consumers to process than incongruent products (van Rompay and Pruyn, 2011). Processing fluency theory suggests that processing fluency is a positive experience (Pleyers, 2021; Septianto et al., 2020). Consequently, products that generate more processing fluency, such as congruent products, would generate a more positive experience, and subsequently more positive evaluations, compared to products that generate less processing fluency (e.g., incongruent products).

A dual-process perspective could reconcile the contradictory predictions of schema congruity theory and processing fluency theory (Graf and Landwehr, 2015). Dual process theories suggest that consumers process stimuli either in a more deliberative, controlled way, or in a more rapid, automatic way (Evans, 2008; Gawronski and Creighton, 2013). It is possible that when consumers process products in a more deliberate, controlled way, the inverted U shape relation occurs. In these instances, solving the puzzle of moderately incongruent products would lead to positive affect, and the failure to solve the puzzle for extremely incongruent products would lead to frustration (Mandler, 1982; Meyers-Levy and Tybout, 1989; Peracchio and Tybout, 1996). Instead, when products are processed in a more automatic way, less processing effort and more processing fluency may lead to higher evaluations for congruent products. This would be in line with the prediction of processing fluency theory (Graf and Landwehr, 2015). The dual-process explanation is supported by the finding that a high motivation to engage in elaboration of brand extensions leads to higher evaluations of moderately incongruent products compared to lower motivation, and consumers with a lower motivation have also been found to evaluate congruent products more positively compared to consumers with a higher motivation (Maoz and Tybout, 2002). In addition, personality traits such as the need for cognition (Cacioppo and Petty, 1982), or openness to change in the context of incongruity (Meyers-Levy and Tybout, 1989), may explain why this monotonic relation was found for subgroups of consumers in our studies. These findings substantiate our approach to consider differences between individual consumers, and to focus on subgroups of consumers, when analysing their responses to products.

6.2. Managerial implications

Our research reveals that, for some consumer groups, higher congruity perceptions lead to higher product evaluations. Our research also reveals that repurposed materials in products tend to be perceived as less congruent than conventional materials. These two findings together imply that at least some consumers prefer products with conventional materials over products with repurposed, incongruently perceived materials.[5] It is valuable for producers and retailers to find out how to increase congruity perceptions of the products made from repurposed materials. Our suggestions are derived from the two mediators in our research that partially explain why repurposed materials lead to incongruity perceptions.

First, producers and retailers may provide information on the transformation process of repurposed materials to show that repurposed materials may not need as many processing steps as consumers may think. The findings of study 2 show that repurposed materials are perceived as needing more processing steps to be useable for the product compared to conventional materials, and this perception results in lower congruity perceptions for repurposed materials. In line with this suggestion, previous research has shown that narrative thoughts about the transformation process from the product's original purpose to its repurposed end form enables consumers to feel a special and positive connection with the product (Kamleitner et al., 2019). This, in turn, increases product demand. Thus, providing the story of the 'processing journey' from the original material to the repurposed form may increase consumers' understanding, and thereby increase consumers' congruity perceptions, of products with repurposed materials.

Second, producers and retailers may increase consumer congruity perceptions and product evaluations for products with repurposed materials by justifying the functional quality of the product. This suggestion is based on our finding that repurposed materials are perceived as being less able to fulfil the product functions compared to conventional materials (e.g., lower perceived softness as T-shirt materials), which, in turn, leads to lower congruity perceptions. Previous research has indicated that consumers tend to consider basic product functions before other features, such as hedonic benefits, when being confronted with new products (Kivetz and Simonson, 2002; Noseworthy and Trudel, 2011). Once products fail to meet consumers' minimum requirements for the function, consumers are less likely to choose the product (Chitturi et al., 2007, 2008). Therefore, it seems essential that producers and retailers focus on the function of products with repurposed materials, convincing consumers that such products do meet consumers' minimum function requirements.

6.3. Limitations and future research

Some of our theoretical and managerial implications give rise to questions for future research. For example, we recommend future research to reconcile the contradictory predictions between schema congruity theory and processing fluency theory, and to identify personality moderators that can explain the differences between the identified subgroups which show different relations between perceived incongruity and product evaluation. In addition, for practical application it would be useful to identify which product properties or narratives can be used to increase congruity perceptions of products with repurposed materials.

It may be possible that our findings have been affected by our use of single-item measures for perceived incongruity and for product evaluation. When using within-subjects designs, it is essential for the quality of the research to avoid participant fatigue and drop outs. Therefore, we measured perceived incongruity with a single item derived from the incongruity manipulation check (Jhang et al., 2012). Similarly, we measured product evaluation with single-item measures that have also been commonly adopted in previous research (Güçlütürk et al., 2016; Kamleitner et al., 2019; Magnier et al., 2019). Indeed, measuring concepts with single-item measures is equally valid to measuring concepts with multiple-item measures that measure the concepts with synonyms (Bergkvist and Rossiter, 2007). Yet, it may be possible that these measures for perceived incongruity and for product evaluations do not capture all relevant dimensions of these concepts. Especially for the concept of perceived incongruity, it is currently unclear whether this concept consists of multiple dimensions. Future research is therefore recommended to validate the current results using multiple-item measures, and to explore the existence of different dimensions of incongruity to gain a better understanding of the concept of incongruity product perceptions.

7. Conclusion

In conclusion, the current research investigated the relation between perceived incongruity and product evaluation, and how material repurposing and naturalness can generate incongruity perceptions. It appears that at least some consumers look more favourably towards products that are perceived as more congruent. It also appears that consumers' incongruity perceptions of products depend on the materials of the product: when repurposed materials are used in products, consumers perceive the products to be less congruent. The more steps are necessary to repurpose the materials, and the more consumers doubt whether such materials fulfil the function of the product, the less they perceive the product to be congruent. Such incongruity perceptions negatively affect product evaluations, leading to lower chances of success for these products. For a move towards a more sustainable future, it may thus be valuable for scholars and producers alike to find ways to improve consumers' perceptions of the functional quality and processing mechanisms of products with repurposed materials.

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Availability of data and code

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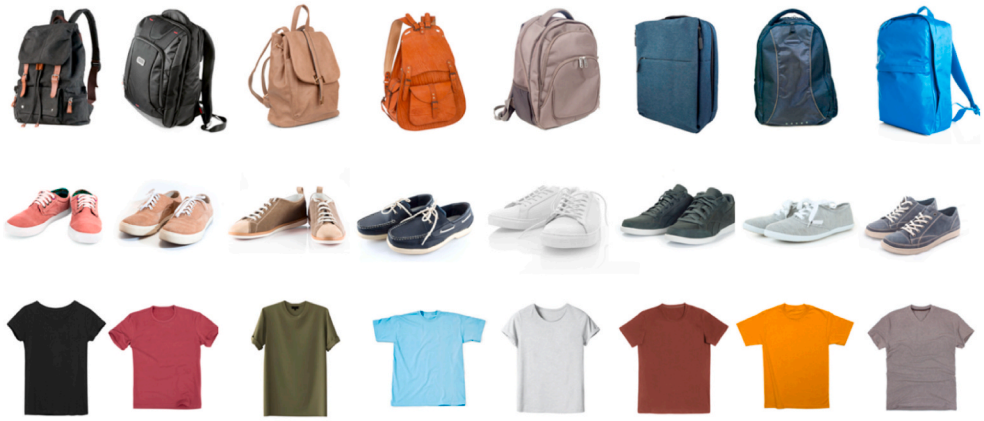
Declaration of competing interest

None.

[5] We conducted pairwise t tests to compare the evaluation between products with repurposed materials and products with conventional materials for cluster 2 in each study. The results indicate significantly higher evaluations for products with conventional materials for cluster 2 in every study.

Appendix A. Product stimuli



Note: All stimuli pictures were purchased from the stock image website (https://www.123rf.com/).

Appendix B

Table 5
The average level relation between incongruity and product evaluation from between-subjects data

Study	Left slope	SE	95%CI	Centred break point	Right slope	SE	95%CI
1a	0.08	0.08	−0.08, 0.24	30.78	−0.35	0.35	−1.03, 0.36
1b	0.51	0.66	−0.75, 1.80	−26.76	0.09	0.07	−0.05, 0.23
2	0.02	0.07	−0.12, 0.16	29.12	−0.003	0.27	−0.53, 0.53
3a	0.14	0.11	−0.07, 0.36	26.25	−0.07	0.27	−0.61, 0.45
3b	0.30	0.18	−0.05, 0.66	11.31	−0.13	0.23	−0.59, 0.34

Note: Posterior distribution means, standard errors and 95% credible intervals of slope coefficients on left and right side of the break point.

Appendix C

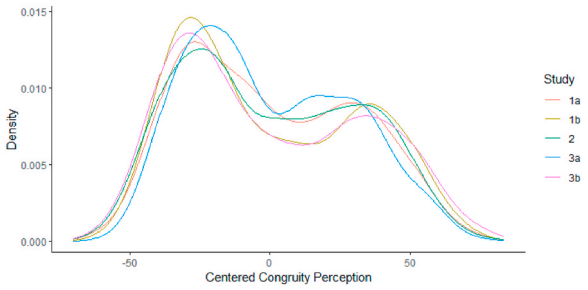


Fig. 4. The distribution of congruity perception across five studies.

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