Article:
Kreuzbauer, R, King, D and Basu, S orcid.org/0000-0002-4457-4247 (2015) The mind in the object—Psychological valuation of materialized human expression. Journal of Experimental Psychology: General, 144 (4). pp. 764-787. ISSN 0096-3445

https://doi.org/10.1037/xge0000080

The Mind in the Object – Psychological Valuation of Materialized Human Expression

Robert Kreuzbauer

Nanyang Technological University

Dan King

National University of Singapore

Shankha Basu

Nanyang Technological University

Word count: 22534

Abstract

Symbolic material objects such as art or certain artifacts (e.g., fine pottery, jewelry) share one common element: The combination of generating an expression, and the materialization of this expression *in* the object. This explains why people place a much greater value on handmade over machine-made objects, and originals over duplicates. We show that this mechanism occurs when a material object's *symbolic property* is salient and when the creator (artist or craftsman) is perceived to have *agency control over the one-to-one materialized expression in the object*. Co-activation of these two factors causes the object to be perceived as having high value because it is seen as the embodied representation of the creator's unique personal expression. In six experiments, subjects rated objects in various object categories, which varied on the type of object property (symbolic, functional, aesthetic), the production procedure (handmade, machine-made, analog, digital) and the origin of the symbolic information (person or software). The studies showed that the proposed mechanism applies to symbolic, but not to functional or aesthetic material objects. Furthermore, they show that this specific form of symbolic object valuation could not be explained by various other related psychological theories (e.g., uniqueness, scarcity, physical touching, creative performance). Our research provides a universal framework that identifies a core mechanism for explaining judgments of value for one of our most uniquely human symbolic object category.

Keywords: Object Valuation; Symbolism; Agency Control; Human Expression; Art and Artifact; Mind – Body Relationship

The Mind in the Object - Psychological Valuation of Materialized Human Expression

Most people place extra value on hand-made objects. Regardless of whether it is a sculpture, which the artist shapes with hands, or an artifact (e.g., wine glass, oriental rug, watch), 'hand-made' is often used as a central element for determining the object's value. Yet, this preference for a hand-made object is puzzling, because it would not always have a positive influence on the artifact's functional performance. Indeed, because hand-making inevitably creates physical and mechanical variance, hand-made objects are often inferior from a functional perspective. Machine-manufactured quartz watches, for example, are significantly more precise than the most expensive Swiss mechanical watches made by the hands of a skilled watchmaker in Geneva.

This leaves us with the question, why do we impute more value on material objects when they are made by hand rather than manufactured by automated machinery? Our manuscript was motivated by this question, and it allowed us to identify a key element in material objects that elicits high valuation: The combination of generating an expression, and the materialization of this expression *in* the object. In other words, the crucial factor underlying high valuation is the perception that the creator's unique personal expression becomes embodied and directly materialized in the object.

The psychological mechanism underlying this phenomenon of object valuation, which we tested in a series of six experimental studies, requires the

co-occurrence of two key factors: (1) The salience of the object's symbolic object property, and (2) The perception of agency control over the creator's materialized expression.

We believe that this allows us to explain a central mechanism that underlies the psychological valuation of some of humanity's most important symbolic object categories: works of art and certain artifacts that contain a salient symbolic component (e.g., fine porcelain or jewelry). We will explain why attributes such as 'hand-made', or the fact that the object is 'the original' and not a duplicate, have such a positive impact on the psychological valuation of these objects. Furthermore, we will discuss why previous theories in psychological object valuation (e.g., uniqueness, scarcity, performance and contagion) cannot sufficiently account for these phenomena.

Our theoretical framework will be explained in the following sections below.

Psychological Theories of Object Valuation

It is well known that modern human beings have developed a very special relationship with material objects, and would assign very high value to some of them (e.g., Belk, Wallendorf, & Sherry, 1989). However, the psychological mechanism that underlies these valuation processes is still poorly understood.

The concept of value is a core construct within both economics as well as psychology. However, an important difference between economic and psychological theories of value is that the former focuses on market value (i.e., value depends on how others value it) whereas the latter has been explained by the level of a hedonic experience that a certain stimulus elicits

(Higgins, 2006, 2007; Glimcher, 2010) as well as the intensity of the experienced attraction towards a particular target (Higgins, 2006). Yet, in order to examine the specific psychological mechanisms of material object valuation, we need to relate this perception of value to *a priori* specifiable object properties and specifiable mechanisms that are tied to how these objects are made (e.g., manual versus automatic processes).

According to identity signaling research (Berger & Heath, 2007), every material object consists of two major properties: (1) functional performance property, which is the level of effectiveness in satisfying a particular utilitarian need (e.g., a knife's function of slicing objects into separate pieces), and (2) symbolic property, which is the ability of the stimulus to represent an important content (e.g., the Statue of Liberty as a symbol of freedom). An object's aesthetic appearance can be subsumed under the functional property that is referring to the function of evoking a certain level of aesthetic appeal (i.e., its beauty), which in turn depends on how much it fulfills certain visual or other sensory properties (e.g., symmetry, figure-ground contrast; see Reber, Schwarz, & Winkielman, 2004 for a discussion).

Along the dimension of the functional performance property, psychological valuation is quite straightforward: any procedure (e.g., hand-making, machine-making, software algorithms) should add value when it helps to improve the degree to which an object performs its function (e.g., a saw that cuts timber in 5 seconds instead of 30 seconds). Aesthetic object properties follow the same logic: the more visually fluent the object becomes as a result of the procedure, the higher its value will be (Reber et al., 2004). In

contrast, the valuation mechanism is less straightforward for symbolic object properties, and therefore requires further elaboration.

Past research in psychology and semiotics has identified various mechanisms underlying symbolic object valuation. In its most basic form, a symbol achieves its value by association between a sign and its content, facilitating the recall of relevant memory (see Nöth, 1995; Kreuzbauer, 2002). For example, alphabetical letters are associated with specific sounds and their value derives from the fact that they can be combined into words to facilitate written communication. Some symbols would achieve their value because they are associated with a positively valued group (e.g., Berger & Heath, 2007, 2008). For example, wearing a Christian Crucifix has value because it is associated with this particular religious group, and allows the person to signal identification with Christianity and its distinction from other religious groups. Yet for all these examples, the symbol's value does not depend on the material object that it is made of, but on its ability to facilitate identification and distinction (see Leonardelli, Pickett, & Brewer, 2010). On the other hand, there are symbols whose value is inextricably bound to a particular material object. Examples would be a toy from one's childhood; Kennedy's briefcase; the Black Stone of Mecca. For such symbolic objects, value derives from the direct association between the singular object and something of worth (Belk, 1988; Belk et al., 1989; Bullot & Reber, 2013), because it allows human beings to recall some positively valued episodic memory, or because it was used in a relevant exchange relationship (e.g., gifts). Research has shown that valuation by association can be strongly affected by the idiosyncratic (historical or cultural) context (Bullot & Reber, 2013).

Importantly, however, there is a substantial difference between these symbolic objects of value and objects such as artwork or artifacts. Although it is possible to psychologically generate any kind of positively valued association with any arbitrary object, an artwork or symbolic artifact (beyond the artifact's functional property) was purposely made by its creator to express something, and this expression becomes materialized in the object (see Danto, 2013). So the relationship between making a unique personal expression and its one-to-one materialization in the object are the main valuation drivers for this specific category of symbolic material objects (i.e., art and symbolic artifacts).

Human Agency and Control over the One-to-One Materialized Expression

Symbolic expression (i.e., creating a symbolic object to communicate or express a particular content) is a good starting point for understanding higher valuations for art and artifacts. But by itself, it would not be sufficient to explain why an original artwork would attain a higher value than an identical duplicate, because both would contain the symbolic information that is representing the creator's expression. For example, Picasso's *Guernica* allows viewers to recall memory contents about the artist, a certain artistic style, or the cruelties of the bombardment of this Northern Spanish city. But the activation of these particular memory contents could occur regardless of whether one is looking at the original, or when looking at a poster print. However, to have a more complete account that also explains why originals are more highly valued than duplicates, perceptions of the degree of human agency (Bandura, 2000, 2006; Malafouris, 2013) need to be included in the

framework. More specifically speaking, art objects or certain symbolic artifacts should be considered as material 'end-statements' (see Gell 1998; Goodman 1976), representing a creator's (i.e., the agent) embodied expression in the singular object. This process of materialization occurs in the very moment of creation and is crucial for such objects to embody the creator's expression. Specifically, symbolic objects such as works of art represent symbolic meaning. However, they only become objects of value once the creator is perceived to have agency control over the process where this symbolic meaning, which represents the creator's intended expression, becomes one-to-one materialized in the singular object. Hence, the object becomes a form of isomorphic representation of the moment of creation (Gell, 1998).

Different Forms of Producing Symbolic Material Objects

This mechanism can best be explained by illustrating it in different procedures for the production of artwork or symbolic artifacts. Intuitively, one would expect the creator to lose agency control once an original is made by a machine, or duplicated. But such simple dichotomies are inconsistent and can be misleading (Grandy, 2007), because it is not always clear what constitutes as hand- or machine-made. Some creators (artists or craftsmen) might only draft some sketches or create prototypes and then use tools, machines or receive support from their assistants for the production of the final object.

Our framework can solve these inconsistencies by putting them under one theoretical umbrella. For example, *Soda Can*, a marble sculpture made by the contemporary American artist Robin Antar, has the shape of an empty soda can. Let us assume that the intended meaning of *Soda Can* is to offer a specific critique on consumerism. Some people could find this to be an

important message, whereas others might consider it irrelevant. Yet, how important one considers the symbolic meaning of an art-object or a symbolic artifact is irrelevant for our psychological mechanism of valuation. What does matter is that the creator transforms this symbolic meaning into one particular symbolic 'end-statement' through a material object. In other words, once *Soda Can* has been carved out of marble block X, it embodies one particular moment of the creator's expression (based on a particular message such as a critique on consumerism). Hence, one specific moment representing the creator's personal expression is 'set in stone' (in marble block X) and any machine or other person that would now duplicate X into marble block Y would be merely copying another person's materialized 'end-statement'. Following our logic, because Y does not represent the creator's materialized expression (which is only materialized in X), it should significantly decrease in perceived value, even though looking at Y could activate the same memory content about consumerism. This finally explains why machine-made does not matter per se, but only when it affects the one-to-one materialization of the creator's expression. For example, there would be no problem if the artist had created three different versions of *Soda Can* as clay models, which are then carved out of three different marble blocks with the help of other people or machines. This is, in fact, a common procedure when an artist or craftsman cannot complete the object alone (e.g., steel sculptures). However, if the artist would only produce one clay-version and a machine duplicates it onto three different marble blocks, the one-to-one materialization is violated because three objects would contain the identical representation of the creator's expression (which was embodied in the moment the clay-version was

created). Note that the one-to-one materialization is again ensured when the artist uses one single clay-version as a prototype from which she produces three different marble-versions by hand (e.g. like Rodin who had one prototype for *The Thinker* from which he hand-made several final sculptures). This is because then the prototype is not the materialized 'end-statement' but merely provides an orientation for the three creator-made 'end-statements', which are materialized in the moment when she hand-shapes each of the three marble sculptures. We summarize these (common) procedures of symbolic object production in a more formalized way in Table 1.

<Insert Table 1>

We believe that the deeper reason we value objects that (one-to-one) embody the creator's unique expression might be because they allow us to utilize what Humphrey (2007) has described as "a way to look into and read another person's mind." He goes on to argue that this would allow us to understand our own consciousness, as well as the general concept of consciousness. From an evolutionary perspective, Humphrey argues that the development of the ability to understand others' minds was a crucial driver that enabled humans to become the most socially skilled animal on Earth (p. 745). A similar argument was recently made by Tomasello (2014a, 2014b) regarding the concept of shared intentionality. This would finally allow us to explain what makes art so special for our species. Functional or aesthetic objects achieve their value as a response to evolved adaptations that provide benefits for survival and procreation (e.g., a higher valuation for the more functional stone axe, or our preference of red and yellow over brown colors)

(see Reber et al., 2004). In comparison, symbolic objects derive their value through their function of facilitating human interaction (Henshilwood & Marean, 2003; Wadley, 2001; see also recent research on cooperation, strategic interaction and cultural evolution: Van Lange, Balliet, Parks, Van Vugt, 2013; Cheng, Tracy, Foulsham, Kingstone & Henrich, 2013; Henrich & McElreath, 2003), and art objects are perhaps our most uniquely human object category, because people feel they allow us to 'look' into other humans' minds. But this requires the co-occurrence of the object's symbolic meaning with its materialization in the singular object (in order to connect the mind with the object).

To sum up, our mechanism of valuation requires two components: a symbolic property (e.g., a motif) to represent a creator's unique personal expression, and its one-to-one materialization in the singular object (i.e., agency control over the embodiment of a certain instance of creation). In our view, these are the core characteristics that distinguish art objects and symbolic artifacts from other material objects. We also believe that it allows us to understand a core psychological mechanism for valuing humanity's most unique object category.

Materialized Expression Versus Other Forms of 'Human-Made'

Given the importance of objects such as art or certain artifacts during human evolution (Henshilwood & Marean, 2003; Wadley, 2001), one could ask if what we describe can be subsumed under something like a human-made effect or a special form of (human) uniqueness. But a label "human-made" would be problematic because by definition, every product or artifact (even machine- or mass-manufactured ones) are made by humans, whereas

our mechanism only applies to a certain form of symbolic human-made material objects. Another intuitive explanation for our phenomenon would be the level of uniqueness. So an original or a hand-made object might just have higher value mainly because it is perceived as more unique. But such an explanation would be inconsistent with current theories of uniqueness and distinctiveness (e.g., Snyder & Fromkin, 1980; Tian, Bearden, & Hunter, 2001), which have their application in the context of group- and social identities (e.g., Vignoles, Regalia, Manzi, Golledge, & Scabini, 2006). For example, according to optimal distinctiveness theory (Leonardelli et.al., 2010), a person who feels too much 'closeness' because he or she is surrounded by a group of people who are all wearing red T-shirts would have an increased need for distinctiveness or uniqueness. But a hand-made red T-shirt which is visually indistinguishable from the other red machine-made T-shirts would not satisfy the goal of distinctiveness, regardless of whether the person signals it to the group or only to himself or herself. Regardless of how the T-shirt is made or whether it carries the creator's expression, a blue T-shirt would be a much more effective means for satisfying one's need for uniqueness. Alternatively, one could argue that uniqueness in this situation is seen as a form of scarcity (e.g., Verhallen, 1982; Verhallen & Robben, 1994; Lynn, 1991), that is, a craftsman makes a handcrafted jewelry, which would be a one-of-a-kind object because no other object would look identical. Still, scarcity as uniqueness would not account for the phenomenon of higher valuation for an object that is the one-to-one materialization of the creator's expression. For example, there is no doubt that an abstract painting by Mondrian contains unique (distinctive or scarce) symbolic elements. But

suppose someone programs a computer algorithm that creates unique Mondrian motifs (under the assumption that the artist is still alive), which even an expert could not distinguish from motifs that were created by the artist himself. Lay intuition would suggest that an algorithm-created motif should be valued less than one created by the artist, though from the perspective of uniqueness or scarcity, this difference should not matter. For that reason, we refrain from labeling our account as “human uniqueness”, because this form of uniqueness would be inconsistent with existing psychological theories of uniqueness.

Other researchers (Newman & Bloom, 2012) have argued that original art objects are preferred over identical duplicates because an original is the result of a uniquely creative performance and a high level of physical contact. Although we agree that these and various other factors could add to an object’s perceived value, we believe that these factors do not capture the main psychological mechanism underlying the valuation of artwork and symbolic artifacts in general, or the reason that people prefer original or hand-made objects. To illustrate, though creative performance and physical contact do play a role in the making of art objects, they apply to functional objects as well (e.g., watches). But as we have argued with regards to functional object properties, any process of production (e.g., hand vs. machine), or the fact that the object is the original and not a duplicate, should only matter if it affects its functional performance.

What about gifts that are also meant to express a unique emotional sentiment, or the high valuations that parents impute on a child’s handicraft? As argued above, gift expression is different from an artistic expression (Gell

1998; Mauss, 1954). A gift's value derives from an exchange relationship (Mauss, 1954), mainly to express reciprocal appreciation or gratitude (e.g., the same process would be activated in response to a nicely crafted love letter). In contrast, the expression that is represented in an art object or artifact does not require an exchange relationship (e.g., publicly displayed art). Furthermore, since most children do not intend to perform a unique expression through the shape of the object when creating a handicraft (they would just try to make something that looks aesthetically appealing or realistic), they would not fall under the category of symbolic material objects that we have characterized here. Nevertheless, it might have 'symbolic value' for the parents in terms of emotional sentiment, or as a placeholder for episodic memories that are valued.

Overview of the Studies

On the basis of our proposed mechanism, we developed a series of hypotheses, which we tested in six experimental studies (plus several replications). In order to demonstrate the robustness of our framework, it was important to choose people without expertise in any particular product category (e.g., the participants are not expert collectors). Participants were recruited through both the Mechanical Turk online panel as well as an undergraduate subject pool, and were asked to estimate an object's value. To demonstrate the robustness of our research, we used a broad range of object categories spanning from simple consumer objects (tea pot, wine glass, vase), to more technological objects (watch), and to different types of works of art (sculpture, painting).

We first tested the hypothesis that our predicted mechanism only applies to objects where the focus lies on symbolic but not functional or aesthetic object properties (Experiments 1a and 1b). We showed this with artifacts and products (wine glasses and watches) to demonstrate that our mechanism does not depend on an art versus non-art dichotomy, but rather on whether the object's symbolic property is salient. This helped to eliminate the alternative explanation that the effect would depend on creative performance rather than the creator's materialized expression. Next, we showed that the mechanism also applies when there is a series of objects (e.g., when a craftsman produces a series of wine glasses) instead of one singular object (Experiment 2). Across these studies, we ruled out various alternative explanations such as uniqueness and scarcity. Furthermore, we then showed that physical contact is just one way of ensuring the creator's materialized expression, but not an independent factor underlying our mechanism of valuation (Experiment 3). Finally, we showed that duplicates would have equally high value as long as the creator's materialized expression is ensured (Experiments 4 and 5). Experiment 5 also demonstrated how our mechanism applies to objects of modern art and procedures that allow the unlimited production of identical symbolic objects.

Experiment 1a: Materialized expression and standardization

Experiment 1a provides an initial empirical demonstration that the materialization of the creator's unique personal expression leads to high perceived value for a symbolic material object in which the creator has agency control over its one-to-one materialized expression (henceforth interchangeably labeled as creator's 'unique expression', 'personal

expression' or just 'expression'). To test this, we manipulated the object property (either functional or symbolic) of a common artifact (i.e. wine glass) and whether the creator has agency control over the transformation (henceforth, (agency) control over the transformation) of the function or the personal expression into the material object. For the symbolic object property this means that the creator's personal expression is transformed into the singular object. For the functional object property it means that it represents the functional performance (i.e. durability) that the creator has produced (i.e. no intervention by others or machine).

To manipulate (agency) control over the transformation we told participants that for the series of wine glasses that had been produced, the variance that naturally occurs in a series of hand-made products is either preserved or removed. In the condition where the variance is preserved, every single product represents what the craftsman had produced. However, this is not any more the case when all products within the series have been standardized (i.e., the variance has been removed). The logic behind this experimental design is that only in the combination with the symbolic object property would agency control over the transformation ensure the one-to-one materialized expression (and therefore increase perceived value). This is because by definition the creator's materialized expression requires a symbolic object property.

We also show that the perception of the creator's personal expression mediates our pattern of results.

Method

Pilot Study

We pretested elements of our experimental design in a pilot study. Details of this study can be found in the online appendix.

Participants and design

One hundred and ninety-six United States adults (61% females; mean age = 35.92, *SD* = 13.25) were recruited through Mechanical Turk and participated in exchange for $1. All data were collected during one round of data collection. Since more recent research (Simmons, Nelson & Simonsohn, 2011; Simonsohn, Nelson, & Simmons 2014; Simonsohn 2014) suggested that researchers should increase the sample size towards 40-50 per cell, we aimed towards this number in this experiment. In a between-subjects, full-factorial experimental design, participants were randomly assigned to one of four conditions: (1) durability (functional property) and preserve variance; (2) shape (symbolic property) and preserve variance; (3) durability (functional property) and remove variance; (4) shape (symbolic property) and remove variance.

Procedure

As part of a research study, participants read one of four scenarios. In each scenario, participants read about wine glasses. We chose this object category because it can have both symbolic (shape) and functional (durability) properties. In the 'type of object property' variable, we either emphasized the symbolic (shape) or the functional property (durability).

Participants read one of the following scenarios:

> Company T is a leading producer of premium crystal wine glasses.
>
> *Shape (symbolic property) & Preserve variance:* The above picture shows one wine glass from its Huemer Roehmer 2010 series. All glasses from this series are 100% hand-blown by highly skilled glassmakers. Glassmaking is a unique craft and every single glass would look slightly different. That is, there are no two glasses within a series whose design is identical.

> *Shape (symbolic property) & Remove variance.* The above picture shows one wine glass from its Huemer Roehmer 2010 series. All glasses from this series are 100% hand-blown by highly skilled glassmakers. Glassmaking is a unique craft and every single glass would look slightly different. That is, there are no two glasses within a series whose design is identical. For this series, the company has developed a special crafts-technique, which ensures that every wine-glass from the Huemer Roehmer 2010 series would in fact look identical. So there is no variance in the design of the individual wine glasses from this series.
>
> *Durability (functional property) & Preserve variance:* The above picture shows one wine glass from its Huemer Roehmer 2010 series. All glasses from this series are 100% hand-blown by highly skilled glassmakers. Glassmaking is a special craft and it is the nature of manual crystal glass production that there is slight variance in the durability of each glass. That is, some glasses would just lose their shine earlier than others.
>
> *Durability (functional property) & Remove variance:* The above picture shows one wine glass from its Huemer Roehmer 2010 series. All glasses from this series are 100% hand-blown by highly skilled glassmakers. Glassmaking is a special craft and it is the nature of manual crystal glass production that there is slight variance in the durability of each glass. That is, some glasses would just lose their shine earlier than others. For this series, the company has developed a special crafts-technique, which ensures that every wine-glass from the Huemer Roehmer 2010 series would have exactly the same (high) durability. So every single glass from this series would keep its shine equally long.

Next, participants answered the following question as a measure of their perceived valuation of the target object: “What is your perceived value of this product”? (1 = *very low value*, 9 = *very high value*).[1]

Afterwards, subjects answered questions for the purpose of testing whether our interaction is mediated by the construct of ‘perceived creator’s personal expression’. We operationalized this construct (α = .95) with the following three items: (1) This product is the result of a very personal expression from a person with rare skills, (2) It seems that the person who designed or made this product has transferred a part of him/her self & personality onto this product, and (3) Such a product is the result of a personal expression.

[1] For all experiment scenarios, disclosure information about additional variables that were included can be found in the online appendix.

Participants rated these items on a 1 (strongly disagree) to 9 (strongly agree) scale after they had completed the value measures. We also included a question about perceived scarcity, in which participants responded to the item “This product is rare”. However, for this and all other studies, we refrained from asking the question how “unique” the object is, because of the inconsistency between lay people’s understanding of uniqueness and what this construct means in psychological science (see argumentation above in the conceptual development).

Results

There were no data removed for the analyses. Consistent with our predictions, a 2 (shape vs. durability) x 2 (preserve variance vs. remove variance) analysis of variance (ANOVA) on perceived value revealed a significant interaction between the two factors, $F(1, 192) = 13.60$, $p = .0003$, $\eta^2 = .07$. As predicted (see Figure 1), perceived value was highest when the wine glass’ shape was emphasized (symbolic property), and the variance was preserved (perceived value: $M = 6.87$, $SE = .25$, CI [6.3, 7.3]), as compared to when it was removed (perceived value: $M = 5.82$, $SE = .25$, CI [5.3, 6.3]), and compares favorably as well against the condition in which the emphasis was on durability (functional property) when the variance was preserved (perceived value: $M = 5.97$, $SE = .25$, CI [5.4, 6.4]), but not when it was removed (perceived value: $M = 6.79$, $SE = .25$, CI [6.2, 7.2]). There were no significant main effects.

Planned contrasts provided further support for our predictions. Participants in the shape and preserve variance condition perceived the object to be of higher value as compared to participants in the shape and

removed variance condition (perceived value: $t(191) = -2.92$, $p = .001$, $d = .54$). Participants in the durability and remove variance condition also rated the object higher in perceived value than participants in the durability and preserve variance condition, $t(191) = 2.28$, $p = .01$, $\eta^2 = .02$, $d = .51$. We performed planned contrast analyses that were relevant to either provide evidence for, or provide evidence against our hypotheses.

<Insert Figure 1>

Mediation analysis

We argued above that the described valuation process occurs because the creator (e.g., artist or crafts(wo)man) of a particular symbolic material object has agency control over his or her one-to-one materialized expression. We tested whether 'perceived creator's expression' would mediate the effect of agency control over the transformation on symbolic object property. Specifically, we examined to what extent the interaction effect of object property X agency control over the transformation would be mediated by perceived personal expression of the creator. This analysis was tested in the context of mediated moderation (Muller, Yudd, & Yzerbyt, 2005; Preacher, Rucker, & Hayes, 2007). A first regression examined the effect of the two main effects and the interaction of object property and agency control over the transformation on perceived value. This analysis confirmed a significant interaction ($\beta = -0.46$, $t(194) = -3.69$, $p = .0003$). A second equation including the same factors was regressed on the mediator, perceived creator's expression, and revealed a significant interaction ($\beta = -0.49$, $t(196) = -3.11$, p

= .002) as well as a significant main effect (β = 0.31, t(196) = 2.00, p = .04) on agency control over the transformation, indicating that preserving the variance would enhance 'perceived creator's expression' across both conditions, and in particular for the shape condition. The last equation added the mediator and the interaction between the mediator and the agency control over the transformation factor to the original model used in equation 1. This analysis showed that the object property X agency control over the transformation influence was reduced, but still remained significant (β = -0.20, t(194) = -2.18, p = .03). On the other hand, the main effect of perceived creator's expression on perceived value reached significance (β = 0.53, t(194) = 12.79, p = .0001). In order to test whether the reduction was significant, we ran two subsequent mediation analyses within the durability (functional) and the shape (symbolic property) conditions. Within durability, agency control over the transformation did not predict the mediator (β = -0.2, t(98) = -0.95, p = .34), whereas within shape, agency control over the transformation significantly predicted perceived value (β = 0.5, t(97) = 2.79, p = .006) as well as the mediator (β = 0.8, t(99) = 3.57, p = .0006). When including the mediator as a predictor, agency control over the transformation became non-significant (β = 0.07, t(97) = 0.5, p = .62) and the mediator remained a significant predictor (β = 0.58, t(97) = 9.88, p = .0001) on perceived value. A Sobel test (z = 3.3, p = .0007) showed that the mediator fully mediated the relationship between agency control over the transformation on perceived value within the shape conditions. This indicates that valuation is only mediated by perceived creator's personal expression within the shape conditions, but not within the durability conditions. We ran two final regression analyses in order to test

whether perceived scarcity might mediate our results. Within the durability conditions, agency control over the transformation did not affect perceived scarcity (p = .16). Within the shape conditions, perceived scarcity was higher when the variance was preserved (p = .02), and it mediated the relationship between agency control over the transformation and perceived value. That is, perceived scarcity was a significant predictor on perceived value (p = .0001) and agency control over the transformation became non-significant (p = .20). However, when also including our mediation variable into this regression, perceived scarcity became a non-significant (p = .51) predictor and the mediation variable continued to be significant (p = .0001). This indicates that it is not perceived scarcity, which underlies our pattern of results but perceived creator's personal expression.

Experiment 1b: Replication with technological product

In Experiment 1b, our goal was to replicate Experiment 1a with a technological product (watch). We followed the same procedure as in Experiment 1a and manipulated the type of object property as well as agency control over the transformation. In addition to that, we added another object property condition, namely aesthetic property (i.e., beauty of the design, but without any symbolic meaning). This allows us to provide a stronger test for our hypothesis that symbolic object property is different from aesthetic object property. The former refers to a visual symbol that is used to express a particular content or meaning (e.g., *Soda Can* = critique of consumerism), whereas the latter represents a visual pattern that activates a response (i.e., feeling of aesthetic appeal) based on an evolved psychological adaptation

towards certain ecologically favorable stimuli (e.g., preference towards symmetric figures because they indicate biological health).

In line with the argumentation for Experiment 1a, we predict that our mechanism of valuation also underlies valuation of technological objects (e.g., a watch) as long as they contain a salient symbolic object property (e.g., a symbolic motif). We applied the same manipulation for agency control over the transformation from Experiment 1a.

Method

Participants and design

We recruited three hundred and sixty United States adults (63% female; mean age = 35.71, *SD* = 12.47) through the same online panel as in the previous experiments, who participated in a series of unrelated studies in exchange for $1. Again, all data were collected during one round of data collection. In a between-subjects full-factorial experimental design, participants were randomly assigned to one of six conditions: (1) accuracy (functional property) and preserve variance; (2) symbolic design (symbolic property) and preserve variance; (3) aesthetic design (aesthetic property) and preserve variance; (4) accuracy (functional property) and remove variance; (5) symbolic design (symbolic property) and remove variance; (6) aesthetic design (aesthetic property) and remove variance.

Procedure

Apart from adding the aesthetic conditions, we used the same procedure as described in Experiment 1a.

Participants read one of the following scenarios:

Swiss company G.D. produces classic-style handmade pocket watches.

Accuracy (functional property) & Preserve variance: The picture above shows one pocket watch from the Fabri series, which contains a variety of cultural symbols from the region where these watches have been produced for almost a century.
The company recently started to use a new high-tech machinery, which improves the precision of each design (so the design looks more vivid). However, because the watches are handmade, the accuracy of each watch within the series can vary.

Accuracy (functional property) & Remove variance: The picture above shows one pocket watch from the Fabri series, which contains a variety of cultural symbols from the region where these watches have been produced for almost a century.
The company recently started to use a new high-tech machinery, which improves the precision of each design (so the design looks more vivid) and also standardizes the accuracy of each watch within the series. So, even though, all watches are handmade (and accuracy can vary from watch to watch), every watch within this series would now have equal accuracy.

Aesthetic design (aesthetic property) & Preserve variance: The picture above shows one pocket watch from the Fabri series. Its design contains a combination of natural motifs (mostly types of leaves and flowers from the region) meant to make the watch look very beautiful. However, the motif does not carry any particular symbolic meaning, because the purpose is not to make an artistic statement but to make the watch look beautiful. Each pocket watch from the Fabri series contains these natural motifs but no two watches would look the same, because every watchmaker has his/her own way in 'translating' them into the watch. The company recently started to use a new high-tech machinery, which improves the precision of each design (so the design looks more vivid) while still preserving the above mentioned motif-variance that exists between the watches.

Aesthetic design (aesthetic property) & Remove variance: The picture above shows one pocket watch from the Fabri series. Its design contains a combination of natural motifs (mostly types of leaves and flowers from the region) meant to make the watch look very beautiful. However, the motif does not carry any particular symbolic meaning, because the purpose is not to make an artistic statement but to make the watch look beautiful. Each pocket watch from the Fabri series contains these natural motifs but no two watches would look the same, because every watchmaker has his/her own way in 'translating' them into the watch. The company recently started to use a new high-tech machinery, which improves the precision of each design (so the design looks more vivid) and also standardizes the motifs across all watches within the Fabri series. So every watch within this series would now have the identical (beautiful) design.

Symbolic design (symbolic property) & Preserve variance: The picture above shows one pocket watch from the Fabri series, which contains a variety of cultural symbols from the region where these watches have been produced for almost a century. Each pocket watch from the Fabri series contains these cultural symbols but no two watches would look the same, because every watchmaker has his/her own way in 'translating' these cultural symbols into the watch. The company recently started to use a new high-tech machinery, which improves the precision of each design (so the design looks more vivid) while still preserving the above mentioned variance that exists between the watches.

Symbolic design (symbolic property) & Remove variance: The picture above shows one pocket watch from the Fabri series, which contains a variety of cultural symbols from the region where these watches have been produced for almost a century. Each pocket watch from the Fabri series contains these cultural symbols but no two watches would look the same, because every watchmaker has his/her own way in 'translating' these cultural symbols into the watch. The company recently started to use a new high-tech machinery, which improves the precision of each design (so the design looks more vivid) and also standardizes the designs across all watches within

the Fabri series. So every watch within this series would now have the identical design.

Next, participants respond to the same value measure as used in the previous experiment: perceived value (1 = *very low value,* 9 = *very high value).*

Results

Just like in Experiment 1a, there were no data removed for the analyses. Figure 2 shows the results from this experiment. We followed the most recent research (Simonsohn et al., 2014; Simonsohn, 2014) about the requirement for statistical power when conducting ANOVAs and therefore decided to conduct three separate 2 X 2 ANOVAs instead of one 2 X 3 ANOVA. As the research by Simonsohn (2014) (see also Simonsohn et al., 2014 for a more detailed discussion) suggests, more complex ANOVAs require much higher sample sizes than previously assumed to produce sufficient statistical power (e.g., close to 1,000 for a 2 X 3 ANOVA and above 1,600 for 3-way ANOVAs).

Consistent with our predictions, a 2 (symbolic design vs. accuracy) x 2 (preserve variance vs. remove variance) analysis of variance (ANOVA) on perceived value revealed a significant interaction between the two factors, $F(1, 242) = 4.18$, $p = .04$, $\eta^2 = .02$, and a significant main effect on agency control over the transformation $F(1, 242) = 17.20$, $p = .0001$, $\eta^2 = .07$. As predicted (see Figure 2), perceived value was higher when the watch's symbolic design was emphasized and the variance was preserved (perceived value: $M = 7.15$, $SE = .22$, CI [6.7, 7.5]) as compared to when it was removed (perceived value: $M = 5.77$, $SE = .22$, CI [5.3, 6.2]). In the conditions in which the emphasis was on accuracy, perceived value was $M = 6.81$ ($SE = .21$, CI

[6.3, 7.2]) when the variance was preserved and $M = 6.34$ ($SE = .22$, CI [5.9, 6.8]) when it was removed. Planned contrasts showed that this difference was significant within the symbolic property conditions ($t(242) = 4.34$, $p = .0001$, $d = .74$) but not within the accuracy conditions ($p = .13$). Again, we only performed planned contrast analyses for differences that were relevant to either provide evidence for or against our hypotheses. So we do not have predictions about the value difference between functional and symbolic property, as this might lie in the idiosyncratic nature of the individual product category. It could be that for some product categories, functionality is more important, and in other product categories, symbolic expression is more important.

Also consistent with our predictions, a 2 (symbolic design vs. aesthetic design) x 2 (preserve variance vs. remove variance) analysis of variance (ANOVA) on perceived value revealed a significant interaction between the two factors, $F(1, 231) = 3.87$, $p = .05$, $\eta^2 = .02$, and a significant main effect on agency control over the transformation $F(1, 231) = 13.39$, $p = .0003$, $\eta^2 = .05$. Again, as predicted (see Figure 2), perceived value was higher when the watch's symbolic design was emphasized and the variance was preserved (perceived value: $M = 7.15$, $SE = .24$, CI [6.6, 7.6]) as compared to when it was removed (perceived value: $M = 5.77$, $SE = .24$, CI [5.2, 6.2]). In the conditions in which the emphasis was on aesthetic, perceived value was $M = 6.37$, $SE = .24$, CI [5.9, 6.8]) when the variance was preserved and $M = 5.96$, $SE = .25$, CI [5.4, 6.4]) when it was removed. Planned contrast tests showed that again, the differences within the aesthetic quality conditions were not statistically significant ($p = .24$). Finally, we performed a 2 X 2 ANOVA

between the two accuracy and aesthetic conditions, but this interaction was not significant (p = .9), and there were also no significant main effects.

<Insert Figure 2>

Further replications

We also replicated Experiment 1a with an undergraduate student sample (n = 73). The results from this replication study were consistent with the pattern of results from Experiment 1a except that durability was not affected by the manipulation (i.e., there was no increase in value for removed variance for durability). Details are reported in the online appendix.

Discussion

The response patterns in experiments 1a and 1b provided evidence in support of our hypotheses. Perceived value was significantly increased when symbolic property co-occurred with agency control over the transformation, because only then would the creator be perceived to have agency control over the materialized expression. This is because every single object embodies unique moments of the creator's expression in the singular object. Once this information is removed (i.e., standardized) the creator loses agency control over the one-to-one materialization to represent these unique instances of expression (because two objects represent the identical instance of expression). Yet, for both functional and aesthetic property, perceived value was either not affected by agency control over the transformation (watch; wine-glass in study with undergraduates) or even increased (in the wine-glass study with MTurk subjects). We do not have any specific hypotheses for this

difference across product categories. But intuitively it would also make sense, because less durability-variance would likely increase the perception of functional properties and perhaps this is particularly salient with wine glasses among adult participants who should be more familiar with this product category. The label ‘high durability’ (in the wineglass study) when variance is removed could have partially contributed to this effect among this group of subjects.

Our mediation analysis allowed us to better clarify this point. It is possible that a person uses different standards of valuation for symbolic and functional object properties. With the mediation analysis, we were able to show that within the symbolic property conditions, perceived value was mediated by perceived creator’s expression. These results provide stronger support for our argumentation that high valuations would be elicited for objects with symbolic property and where the creator has agency control over the materialized expression in the object.

There are some other potential limitations that need to be addressed. First, in the symbolic property & preserve variance condition in Experiment 1a, perceived value could have been partially affected by the fact that the standardized products deviated from the norm, as there is usually some design variance among hand-made wine glasses. But Experiment 1b helps to control for this alternative explanation since the effect is not observed within the aesthetic property conditions, even though it describes the same type of deviance from the norm. Second, there are slight differences in text content and length across conditions, which is unavoidable in the process of operationalizing experimental conditions in complex phenomena regarding

symbolic material objects. That is, ideally one would just change a few words and keep everything else equal. But, this is not always possible in the examination of research topics that target constructs such as art, symbolism or the creator's expression. For example, merely changing words such as art with artifact or symbolic with aesthetic (or even priming subjects with such words) could potentially lead to Gricean demand effects or potentially even third variable problems, due to the connotations that people ascribe to such terms. The only solution to this problem (which is also used by other researchers such as Newman and Bloom in their 2012 article) is by trying to counterbalance the content across conditions. However, we carefully compared text-content and text-length vis-a-vis our pattern of results and we do not find any evidence in any of our studies that these factors could have systematically biased the results (see online appendix for details).

Experiment 2: Source of symbolic information

The previous experiments showed that our suggested valuation mechanism requires the co-occurrence of an object's symbolic property and the perception that the creator's expression is represented in the object (i.e. variance is preserved). Hence, the mechanism of materialized expression does not apply to objects with purely functional or aesthetic properties. This is because only a symbolic object property would allow the creator to embody the creator's expression. Experiment 2 will more specifically focus on the difference between symbolic motifs that carry the creator's expression, because they were made by a human being, versus those motifs that are merely unique. This allows us to eliminate the alternative hypothesis that our results could be explained by uniqueness. We therefore described an object

(vase) whose motif was either created by a human being or a computer algorithm. Although both motifs would have aesthetic object properties, only the former can function as a symbolic object because it carries the expression of the creator. Furthermore, we manipulated the uniqueness of the motifs. We did this by informing subjects that the producer had designed a series of ten premium vases, but in one condition, the artist or the algorithm created either one unique design that was duplicated onto the other vases, or each of the ten vases had uniquely different designs, but which were clearly identifiable as belonging to the same series. Consistent with our hypotheses, the vases with the highest perceived value should be the ones where each vase had a uniquely different design, but only when a human being designed them (see procedure 2 in Table 1, p. 10). This is because only then would a human creator have agency control over the materialized expression for each individual object. The same is not possible for the algorithm created designs, because even though they are all uniquely different, they do not represent the personal expression of the creator because they were not made by a human being. Likewise, the one-to-one materialization is violated when one human-designed motif is machine-duplicated onto more than one object, because the motif, which represents one unique instance of a creator's personal expression, is copied onto more than one object (just like procedure 1 in Table 1).

It is possible that participants would doubt that a software algorithm could generate design motifs that are indistinguishable from those made by an artist. To prevent this, we chose designs that were similar to the ones that modern computer screen-savers would generate. Furthermore, we included a

question at the end of the survey, where we asked subjects in the software-algorithm conditions whether they believed that they could tell the difference between a design that is generated by a software algorithm versus one that is made directly by a human.

Finally, we again include various items to measure whether the object is perceived as scarce or is perceived as the result of the creator's unique expression, which allows us to test whether our pattern of results is mediated by this construct.

Method

Participants and design

We recruited one hundred and seventy-seven United States adults (56% female; mean age = 34.82, *SD* = 12.51), through the same online panel as in the previous experiments, who participated in a series of unrelated studies in exchange for $1. Just like in the previous experiments, we collected all data in one round of data collection, and the sample size was again determined by aiming towards 40-50 subjects per cell. In a between-subjects full-factorial experimental design, we described the object (vase) as either designed by a designer (human-designed manipulation), or by a creativity algorithm, and whether a series of these vases would all have the same or different designs (uniqueness manipulation).

Participants read one of the following scenarios:

> Company E is a leading producer of glass vases. It produces vases for both premium markets (i.e. high price) and typical consumer markets (i.e. mid-price).
>
> *Designer-made design & Unique designs (ten different designs).* The above picture shows one of the company's premium (high-price) vases, which is from the Nuova Serenga series. There exist only 10 vases from this series. Each of them was designed by renowned glass designer Swena Ingen. She would create unique designs for each of the 10 vases (i.e. they are 10 unique designs, but clearly identifiable as being from to the same series), which are then individually produced by fully automated glass manufacturing machinery.

Designer-made design & No unique designs (one design duplicated onto the other objects). The above picture shows one of the company's premium (high-price) vases, which is from the Nuova Serenga series. There exist only 10 vases from this series. Each of them was designed by renowned glass designer Swena Ingen. She would design one unique design-prototype for the entire series. Then, fully automated glass manufacturing machinery would produce 10 identical duplicates from this design-prototype.

Algorithm-made design & Unique designs (ten different designs). The above picture shows one of the company's premium (high-price) vases, which is from the Nuova Serenga series. There exist only 10 vases from this series. Each of them was designed by the company's unique creativity algorithm. The creativity algorithm would create unique designs for each of the 10 vases (i.e. they are 10 unique designs, but clearly identifiable as being from the same series), which are then individually produced by fully automated glass manufacturing machinery.

Algorithm-made design & No unique designs (one design duplicated onto the other objects). The above picture shows one of the company's premium (high-price) vases, which is from the Nuova Serenga series. There exist only 10 vases from this series. Each of them was designed by the company's unique creativity algorithm. The creativity algorithm would design one unique design-prototype for the entire series. Then fully automated glass manufacturing machinery would produce 10 identical duplicates from this design-prototype.

Next, participants answered the same set of questions from Experiments 1a and 1b to measure perceived value, perception of creator's expression, and perceived scarcity. To check whether our manipulations were working as intended, we also asked participants if they thought that they could tell the difference between a vase design that was designed by a human being versus a design that was generated by a computer algorithm.

Results

We excluded one extreme outlier (more than 3 standard deviations below mean), who also showed a very strange response pattern because this person provided only extreme responses (1 or 9). Nonetheless, including this subject's responses did not change the overall pattern of results. Consistent with our predictions, a 2 (human-designed: yes vs. no) x 2 (unique designs: yes vs. no) analysis of variance (ANOVA) on perceived value revealed a significant interaction between the two factors, $F(1, 173) = 5.49$, $p = .02$, $\eta^2 =$

.03. As predicted (see Figure 3), perceived value was highest when the vase design was designed by a designer and each of the ten vases had a uniquely different design (M = 7.33, SE = .28, CI [6.7, 7.9]) as compared to when they all had identical designs (M = 6.59, SE = .28, CI [6.0, 7.1]) or when the vases were designed by a creativity algorithm for both when they had unique (M = 5.71, SE = .27, CI [5.1, 6.2]) or identical designs (M = 6.28, SE = .27, CI [5.7, 6.8]). There was also a significant main effect of being human-designed, $F(1, 173) = 11.66$, $p = .0008$, $\eta^2 = .06$, which shows that the human-generated design generated higher valuations compared to the algorithm-generated design across all conditions.

Planned contrast tests provided further support for our predictions. Participants in the human-designed/uniqueness condition perceived the object to be of higher value as compared to participants in the human-designed/non uniqueness condition, $t(172) = 1.84$, $p = .03$, $d = .44$. The unique designs were valued less than non-unique designs within the algorithm-designed conditions, but this difference was not significant ($t(172) = -1.46$, $p = .07$). Furthermore, human-designed/unique was higher than algorithm-designed/unique ($t(172) = 4.04$, $p < .0001$, $d = .78$), but not within the non-unique conditions ($p = .4$)

<Insert Figure 3>

Mediation analysis

To test whether perceived creator's expression mediates the interaction between human-designed and uniqueness, we performed three regression analyses. A first regression examined the effect of the two main effects and

the interaction of human-designed and uniqueness on perceived value. This analysis showed a significant interaction (β = 0.33, t(175) = 2.34, p = .02) and a significant main effect of human-designed (β = -0.48, t(175) -3.41, p = .0008). A second equation including the same factors was regressed on the mediator, perceived creator's expression, and revealed a significant interaction (β = 0.38, t(175) = 2.40, p = .01) as well as a significant main effect (β = -1.51, t(175) = -9.32, p < .0001) of human-designed, indicating that letting a designer design the vase would enhance perceived value across both conditions, and in particular for the uniqueness condition.

The last equation added the mediator and the interaction between the mediator and the uniqueness factor to the original model used in equation 1. This analysis showed that the human-designed x uniqueness interaction was no longer significant (β = -0.05, t(175) = -0.35, p = .72). The main effect of creator's expression reached significance (β = 0.52, t(175) = 9.60, p < .0001). The main effect of the human-designed factor continued to be significant (β = 0.36, t(175) = 2.50, p < .01), and the interaction between the uniqueness factor and the mediator also were significant (β = -0.11, t(175) = -2.12, p = .03). This suggests that the degree of perceived creator's expression mediated the relationship between the perception of human-designed versus algorithm-designed and valuation. We also tested whether scarcity would mediate our pattern of results, but the two manipulated factors did not significantly predict perceived scarcity (p = .12).

The question of whether participants felt that they could notice the difference between a designer- or algorithm-designed vase received a mean score of 1.57 (sd = .97) on a 9-point scale (1 = lowest) within both algorithm

conditions, and the difference between the uniqueness and non-uniqueness condition was not significant (t = -0.84). Note that we asked this question only in the algorithm conditions because such a question would not make sense in conditions where a design creativity algorithm did not exist.

Replication

We also replicated the study, but this time with an average quality vase instead of one with premium quality. For this replication study, all conditions from Experiment 2 remained the same, except that the description of the product was about an average quality product, produced for the mass market. As predicted, there was no significant interaction (p = .53) and no significant main effects (p = .27 and .72) when the product was not a premium product. This lends additional support for our hypotheses, that high perceived value requires the object to be the result of a creator's unique personal expression and not just anything 'hand- or human-made' (e.g., tourist souvenirs).

Discussion

Experiment 2 provided additional support for our hypothesis that symbolic object valuation is determined by the one-to-one materialization of the creator's expression into the particular material object. Therefore, the condition where the vase-design was made by a human being (and not by an algorithm) and in which every single vase had a uniquely different design generated the highest perceived value. As shown by the mediation analysis, only this interaction generated the perception of creator's expression as a consequence of the symbolic object property, where the creator has agency control of the materialized expression into every single object (because the creator designed 10 different motifs which he or she has one-to-one

materialized into 10 singular objects). Participants did not believe that they could tell the difference between a designer- or algorithm-designed vase, which indicates that for our design motifs, subjects assumed that algorithms could create motifs that are of equal aesthetic quality with what a designer or artist could make. These findings support our argumentation that our mechanism cannot be explained by uniqueness, because only the human-made unique designs lead to high valuation, but not the algorithm created unique designs, and these results rule out extant psychological theories of uniqueness (as argued in the introduction), which posit that this difference would not matter. Likewise, our results cannot be explained by other variables such as perceived aesthetic appeal, as this would not depend on who designed the motif and whether the object carries a one of a kind motif, versus one that was replicated onto 10 other objects.

These results confirm our prediction that a core factor for our mechanism of symbolic object valuation is that the creator needs to be perceived as having agency control over the materialized expression for each single object, because only then would there be a direct representation of the creator's expression in the singular object. As long as this is the case, our mechanism of valuation occurs for a single object (i.e., only one of a kind) or a series of objects. There is another important difference between the current experiment and the previous experiments. In this experiment, the symbolic motif representing the creator's unique expression happened before it became materialized in the object with automatic machinery. This shows that our effect does not require the creator to physically shape the expression into the object, but that this could also be outsourced to a machine. In other

words, using machines does not affect our proposed mechanism of valuation as long as ten motifs, representing ten unique expressions, become transformed into ten different end-objects. This is not the case when a machine duplicates one motif onto several material objects, as more than one end-object would represent the same instance of the creator's expression (compare procedures 2 vs. 1 in Table 1, p. 10).

Our results show a main effect on the human-designed motifs, which intuitively makes sense because subjects may, on average, expect human-made designs (especially if a famous designer or artist made them), to be of higher value than algorithm-made designs.

In line with the findings from the previous experiments, these results provide additional evidence for our proposed mechanism of symbolic material object valuation. High perceived value only occurs for those symbolic objects where the symbolic expression originates from an act of creation and its embedded unique expression, and where this expression is one-to-one materialized into the singular material object.

Measuring Perceived Value by Comparing Originals with Duplicates

The previous studies showed that unlike functional or aesthetic objects, symbolic objects (artwork and symbolic artifacts) achieve high perceived value because they represent the creator's materialized expression. However, this only occurs when the creator had agency control over the one-to-one materialization of his expression in the individual object, which for instance is the case when the natural variance between a series of hand-made products is preserved. We also showed that the mechanism cannot be simulated by

uniquely different motifs that had been created by a creativity algorithm, because these motifs were not the result of a creator's expression.

But there is at least one psychological concept that seems to be quite similar to our predicted mechanism of the perception of a one-to-one materialized expression. In many cultures, people might attribute a certain 'aura' (see Benjamin 1936/1968) to artists as people with special skills. That is, people might just assign higher value to an art-object because it was created, associated with or merely touched by a special human being, and hence this person's 'spirit' is perceived to have transferred into the object (e.g., Newman & Bloom, 2012; Newman, Diesendruck, & Bloom, 2011).

The problem with testing this alternative explanation against our story is that such attributions might automatically occur when subjects compare objects that are perceived as 'art' with others that are perceived as 'decorative' or merely 'aesthetic'. Likewise, it is also challenging to describe such similar constructs in a way that there would be no conceptual overlap between them. For example, it seems unlikely that subjects could perceive a décor object as only consisting of aesthetic properties and zero symbolic properties. In reality, we should always expect some slight overlap.

In order to provide evidence against these possible confounds, we apply a different kind of valuation measure for the remaining experiments, which will allow us to provide a stronger test for our predicted mechanism that high perceived value depends on the one-to-one materialization of the expression. For experiments 3-5, we therefore measure an object's perceived value by comparing the drop in perceived value of duplicates or second copies that were made from originals (see Newman & Bloom, 2012). For

instance, let us assume that in one situation, someone creates an art object, and another situation in which the same person creates a decorative object. As argued above and in the conceptual development, the former would contain expressive meaning, whereas the latter is just aesthetically appealing. Obviously we would expect that people perceive an ‘art-object’ to have more value as compared to a ‘decorative’ object (some reasons could be the ones just mentioned, but also because of assumed higher creativity, scarcity, etc.). But let us now assume that the creator of the original would make identical duplicates from both objects. In general, a duplicate would be of lower perceived value than its original. But the the value of a duplicate compared to its corresponding original (henceforth described as the decrease in perceived value of the duplicate compared to its original) should be essentially the same for both the décor- and the art-duplicate if the creator of the original made them (like adding another unit to a series of either décor- or art objects). For the purpose of our study, we will use this difference in decreased perceived value across the two pairs of original-duplicates as our baseline measure. Against this baseline, we can then compare the decrease in perceived value of other pairs of original-duplicates. For example, imagine the decrease in perceived value for the creator-made décor-duplicates is 1.5 (on a scale from 1-9) and for the creator-made art-duplicates it is also 1.5. So the difference in decrease in value (i.e., how much less the duplicate is valued compared to the original) across creator-made pairs of original-duplicates is 0. In a second step, we can use this number and compare the decreased value of other pairs (e.g., where the duplicates were made by an assistant). The big advantage of this relative value measure is that it allows us to compare two more or less

identical objects (i.e., original against duplicate). In a second step, we can then examine how single factors influence the difference in perceived value between the original and the duplicate. With this procedure, one could even compare paintings from world famous artists with paintings of lesser known local artists. Perceived value for the former would be much higher, but for both groups, the decrease in value should be largely the same if duplicates were made by the creators of the original paintings.

As was recommended by proponents in the most recent scientific debate about sample size (Simonsohn et al. 2014; Simonsohn 2014) in social and behavioral experiments, we needed very large sample sizes (above 400), to ensure that the baseline-differences (or sometimes non-differences) are unlikely to be the result of other variables or random error. We therefore collected data for all these studies in one sitting. Participants were told that they would participate in a series of unrelated studies, where experimental conditions across the studies were presented to them in a randomized order.

Experiment 3: Materialized Expression and Amount of Physical Contact

Experiment 3 provides a first demonstration of this experimental paradigm by also eliminating the important alternative explanation, which others (Newman & Bloom, 2012; Newman et al., 2011) have described as the contagion effect (i.e., the amount of physical touching leading to a belief of a transfer of essence or ‘aura’ (Benjamin 1936/1968) from artist to object). Consistent with anecdotal evidence, and with previous research about art valuation (Newman & Bloom, 2012), the creation of highly valued symbolic material objects often involves a high amount of physical touching. We argue however, that this so called contagion effect can be better subsumed by our

suggested mechanism, which does not require contact. In other words, when the creator touches the object, he or she ensures that his or her unique expression is materialized in the particular object that was shaped through touching. However, we believe that the intensity of physical contact is not a necessary condition to ensure agency control over the one-to-one materialized expression. Physical contact is simply one instantiation of ensuring agency control, and a common channel through which the creator's expression can materialize in the symbolic object.

To test this account, we ask subjects to determine the value of a sculpture made by an artist who had either high or little physical contact when shaping the object. These two conditions were adopted from past research conducted by Newman and Bloom (2012). Afterwards, we used our new relative valuation measure and asked subjects to compare the sculpture's perceived value with the perceived value from an identical machine-made duplicate. We expect perceived value to decrease more for the duplicate made from the sculpture where the artist had high physical contact as compared to a duplicate made from a sculpture where he had low physical contact. The logic is as follows: The creator has no agency control over his materialized expression in the (identical) machine-made duplicate. So if the original high contact sculpture was valued higher because of agency control, then the perceived value for the duplicate made from this high contact original should also decrease more (compared to a duplicate made from a low contact original with limited agency control). However, this result would not yet provide sufficient evidence to support the agency control hypothesis, since the same result would be expected for the contagion effect. Namely, because a

machine-made duplicate by definition erases every contagion effect, perceived value for the duplicate made from a high contact original should also decrease more. We therefore introduce two further experimental conditions where agency control is additionally manipulated by writing that either high or low contact is needed to ensure a one-to-one materialization of the creator's expression. It is possible that some subjects might doubt that low contact would allow the creator to (accurately) materialize his expression in the object. Hence, to make this claim credible, we wrote that the artist engaged in a process of 'mental sculpting,' where he shapes the entire sculpture in his head without touching the clay. Afterwards, depending on the experimental condition, the artist needs either high or low contact with the object to ensure that the 'mental sculpture' is represented in the object. In the low contact condition, low contact ensures agency control so that the mental image does not get lost as a result of too much time spent on the sculpture. Alternatively, in the high contact condition, high contact ensures that the mental sculpture is represented in the object, because he has sufficient time to transform the mental image into the object. Finally, perceived value is again measured by asking subjects to compare the sculpture's perceived value with the perceived value from an identical machine-made duplicate. Since agency control is present in both of the latter two conditions (regardless of the amount of physical contact), perceived value should decrease equally for machine-made duplicates. This result would be inconsistent with the contagion effect. This is because if the amount of physical contact is truly an independent factor, then perceived value should again decrease more for the duplicate

from the high contact original. At most, the agency control manipulation should add a main effect.

To provide further evidence that our relative value measure is able to control for factors such as amount of effort or time spent on the project, we included another two conditions. These two conditions were identical to the first two conditions (where only high or low contact was manipulated), except that they did not include specific information about the amount of time the artist needed to complete the work. Because the amount of effort or time that is needed to complete the object should not affect our results, there should be no difference between conditions that did or did not have specific information about the amount of time that was needed to complete the work.

Method

Participants and design

We recruited six hundred and sixty-six US adults (63% females; mean age = 37.58, *SD* = 13.02), through the same online panel as in the previous experiments participating in a series of unrelated studies in exchange for $1. To increase sample size and the likelihood that we would be able to recruit enough subjects, we collected the data in two waves of data collection. The results after the first wave did not differ from the results after including both waves. In a between-subjects full-factorial experimental design, we applied Newman and Bloom's (2012) manipulation of contagion by describing whether the artist had a lot or little physical contact when crafting it.

Participants read one of the following scenarios:

> *Low amount of physical contact (low contagion) & No additional agency control manipulation*
> A well-known artist was working on a modern clay sculpture. The particular process that he used was very "hands-off"—meaning, he used a lot of machinery and had

very little physical contact with the sculpture. The sculpture took him several days to complete.

High amount of physical contact (high contagion) & No additional agency control manipulation
A well-known artist was working on a modern clay sculpture. The particular process that he used was very "hands-on"—meaning, he spent a long time physically touching the sculpture during the sculpting process. The sculpture took him several days to complete.

Low amount of physical contact (low contagion) & Additional agency control manipulation
A well-known artist was working on a modern clay sculpture. The process for such sculpture is very "hands-on"—meaning, the artist would spend a long time physically touching the sculpture during the sculpting process, because this allows an artist to develop and shape the unique artistic expression. However, this artist is known for a different approach. He would spend many days on "mental-sculpting," where he forms the sculpture in his head, but without touching the clay. The artist states: "My goal is to shape the sculpture until I can clearly see it in my head. This can take more than a week and involves an enormous amount of mental effort. But transforming the mental sculpture into clay has to be done with as minimal physical touching of the clay as possible. At most I spend half an hour on that, otherwise the physical sculpture would be different from the mental one".

High amount of physical contact (high contagion) & Additional agency control manipulation
A well-known artist was working on a modern clay sculpture. The process for such sculpture is very "hands-on"—meaning, the artist would spend a long time physically touching the sculpture during the sculpting process, because this allows an artist to develop and shape the unique artistic expression. However, this artist is known for a different approach. He would spend many days on "mental-sculpting" where he forms the sculpture in his head, but without touching the clay. The artist states: "My goal is to shape the sculpture until I can clearly see it in my head. This can take more than a week and involves an enormous amount of mental effort. But I spend even more time on transforming the mental sculpture into clay. This would require a very high amount of physically touching and forming the clay, otherwise the physical sculpture would be different from the mental one".

The two conditions where the amount of time (that was needed to complete the object) was not mentioned were identical to the two conditions without an additional agency control manipulation, except that they did not contain the last sentence.

Next, participants answered questions about perceived value. As explained above, we applied the relative valuation measure (compare perceived value between the original and its duplicate), which we adopted from Newman and Bloom (2012). We asked participants the following question: "If a machine would make an exact duplicate from this sculpture, and the duplicate is identical in every way with the original (i.e., material, size, form and texture), how much would this machine-made duplicate be worth

compared to the original?" (1 = *a lot less*; 11 = *a lot more*; note that only for this measure we used a 1-11 scale*;* for the purposes of a more intuitive representation of the findings, we converted the scale to a -5 to 5 scale, where 0 represents equal perceived value between the original and the duplicate). A lower scale value means a larger decrease in perceived value of the duplicate in comparison to the original (i.e., on the converted scale, this means the further the mean value is below 0).

For consistency and for control purposes, we also included the same direct measure of perceived value of the original sculpture, and a few other measures as we did for all the previous experiments (e.g., perceived effort, creativity, items from our previous mediation analyses, etc.). Details are reported in the online appendix.

Results

Consistent with our predictions, a 2 (contact: high vs. low) x 2 (additional agency control manipulation: yes vs. no) analysis of variance (ANOVA) on our perceived value measure (measured by the decrease in perceived valued of a machine-made duplicate compared to its hand-made original) revealed a significant interaction between the two factors, $F(1, 445) = 39.95$, $p = .0001$, $\eta^2 = .07$. As predicted (see Figure 4[2]), perceived value of the duplicate decreased the most for additional agency control manipulation and high touch ($M = -3.37$, $SE = .18$, CI [-3.7, -3.0]), agency control manipulation and low touch ($M = -3.20$, $SE = .18$, CI [-3.5, -2.8]), and no agency control manipulation and high touch ($M = -3.79$, $SE = .18$, CI [-4.1, -

[2] We would like to acknowledge the suggestions that reviewer one and two have provided us in order to improve the understandability of the representation of our findings for Experiments 3, 4, and 5. Reviewer one suggested the re-coding of the scale and reviewer two suggested the label for the Y-axis.

3.4]). The lowest decrease in perceived value occurred for the duplicate in the no agency control manipulation and low touch condition (M = -1.31, SE = .18, CI [-1.6, -0.9]). There were significant main effects both for agency control manipulation, $F(1, 445) = 16.08$, $p = .0001$, $\eta^2 = .03$, and touch $F(1, 445) = 52.17$, $p = .0001$, $\eta^2 = .09$, which shows that both agency control manipulation as well as high physical contact affected perceived value across all conditions and independent from the other variable.

Planned contrast tests provided further support for our predictions. The decrease in value for the duplicate in the no agency control manipulation/low touch condition was significantly muted as compared to all other conditions: Planned contrast tests between no agency control manipulation/low touch to no agency control manipulation/high touch were significant, $t(448) = -9.65$, $p = .0001$, $d = 1.35$. Planned contrast tests between no agency control manipulation/low touch and agency control manipulation/low touch were significant, $t(448) = 7.32$, $p = .0001$, $d = .92$. Planned contrast tests between no agency control manipulation/low touch and agency control manipulation/high touch was significant, $t(448) = 7.95$, $p = .0001$, $d = 1.05$. All other contrasts were not statistically significant.

The ANOVAs with conditions where the amount of time (i.e., that was needed to complete the object) was not mentioned replicated the pattern of results in the previous findings. Details are reported in the online appendix.

<Insert Figure 4>

Discussion

Our relative valuation measure provides information about how much a machine-made duplicate decreases in perceived value compared to its original. For that purpose, we need to compare each condition's mean value (e.g., -3.20 for the low contact and agency control condition) against 0 where the original and the duplicate are perceived to have equal value.

As can be seen in Figure 4, the mean values of all four conditions where agency control was present (i.e., all conditions with high contact and the conditions where agency control was additionally manipulated) were significantly lower than the mean values of the two conditions without agency control. This is consistent with our proposed mechanism, because a core factor that underpins an art object's (X) perceived value is the perception that object X embodies the artist's unique expression, which was made during the very moment of creation. If a machine just duplicates object X into object Y, both objects would represent the same moment of creation. This would go against the agency control hypotheses, which requires singular objects to be a one-to-one representation of singular moments of creation (to represent the creator's expression). Furthermore, our findings are inconsistent with the contagion effect. If the amount of physical contact itself would affect our mechanism of valuation, the perceived value would decrease more for all duplicates made from the high contact originals.

We would like to address some limitations. One question could be whether our description of the 'mental sculpting' process could make people believe that the artist put in extra effort. But when comparing the results across all three high contact conditions (including those where the amount of working time was not mentioned), this seems to be implausible. Perceived

value was largely equal across these three conditions, despite the fact that in the conditions where the amount of working time was not mentioned, the artist should be perceived as putting in less effort because it did not include the information that he invested one entire week to complete this project. Another question could be whether our agency control manipulation was fully understood by our participants. First, the decrease in value indicates that the manipulation worked. Second, at the end of the survey, we had included some items about the understandability of our scenarios, and the mean response was 7.3 (on a scale of 1-9, with 9 indicating the highest level of understandability), which is the same mean that we have received for similar scenarios from other experiments and projects. There were also no significant differences in perceived understandability across the experimental conditions (likewise, there were no differences in perceived understandability across conditions in Experiments 4 and 5). This is consistent with the notion that participants had no problems in understanding our scenarios. In fact, we believe that such descriptions of art-production procedures are similar to what a layperson has typically read about contemporary art, because similar art-projects are present in museums of modern art.

The findings from Experiment 3 also show that our valuation mechanism is not affected by the form of production, specifically, whether the artistic expression is created directly on the object or whether the artist first engages in an imaginary design process (mental sculpting). Such factors influence our mechanism only when they affect the one-to-one materialization of the creator's expression, which was the case for the machine-made duplicates. In the final two studies, we examine situations when duplicates are

created by the artist himself or herself, and when 100% identical duplicates can be produced because the original was also produced by machine.

Experiment 4: Decrease in Perceived Value of Duplicates in Art or Décor Objects

In the previous experiment, we tested the hypotheses using our new relative valuation measure (by comparing originals with duplicates), that Newman and Bloom's (2012) contagion effect could be subsumed by our proposed mechanism. In Experiment 4, we will test our hypothesis that the mechanism of valuation does not depend on whether a person is familiar with the object's symbolic meaning. Furthermore, we will address the question of how perceived value is affected by the number of objects that are made. In particular, we will examine whether perceived value differs when there exists only one copy from an object, compared to when there exists more than one copy (e.g., a one of a kind art or décor object versus an entire series).

For that purpose, we again applied our relative valuation measure by comparing perceived value between the first and second copy from an art-object (salient symbolic object property) or from a décor-object (salient aesthetic object property). These second copies were either produced by the creator of the original, or by another person (a skilled craftsman).

We predict that when the creator of the original makes a second copy, the decrease in perceived value of the second copy (compared to the first copy) should be largely identical, regardless of whether the original is an art- or a décor object. For the art object, this is because the second copy would represent another instance of a one-to-one materialization of the creator's expression (e.g., Rodin, who created several versions of *The Thinker*

sculpture – see procedure 3 in Table 1, p. 10). For the décor object, the creator is expected to be familiar with the aesthetic rules that he or she had applied to the original, and should therefore be able to produce a second copy of largely identical quality. However, if another person makes a second copy from an art object, this second copy should have significantly lower perceived value, because it lacks the creator's one-to-one materialized expression (see procedure 1 in Table 1). This result would not change even though the second person has full information about the artwork's symbolic meaning, because knowing the symbolic meaning cannot substitute the embodied expression of the creator. However, this is different when the object is a décor-object, and the second person is familiar with the aesthetic rule, which then could just be re-applied to the second copy.

As argued above, the big advantage of measuring value by comparing objects is that it allows us to control for a variety of additional associations that might automatically become activated when measuring perceived value directly. For example, perceived value of a décor-object would most likely always be lower than the perceived value of an art-object. Subjects might judge art-objects to be more complex, more creative or because they believe that 'art is special'. But by comparing two objects, we can better control for these associations by solely focusing on factors that we expect to affect the differences in perceived value between object one and two.

Consistent with this line of argumentation, we create a first baseline measure where we ask subjects to determine the change in perceived value of a second copy compared to a first copy, which was either an art object or a décor object. The creator of the first copy (henceforth the original) made both

of these second-copy objects and hence their perceived value should not differ substantially from their respective first copies. In another two experimental groups, we ask subjects to compare the same pairs of first- and second-copy objects. However, in these two conditions, the second copies were described as made by a craftsman who was not familiar with the art object's symbolic meaning or the applied aesthetic rule for the décor object. Perceived value should decrease significantly for these two second-copy objects because the craftsman could not simulate the creator's materialized experience. Additionally, the craftsman could not make a high-quality copy from a décor object if he or she is not familiar with the aesthetic rule. Finally, we had another two groups of first-second copy comparisons. For these two groups, a craftsman who was familiar with either the symbolic meaning or the aesthetic rule made the second copies. As described above, this should only mute the decrease in perceived value of the second copy of the décor object (because the craftsman can produce a better duplicate if he knows the rule). For the second copy from the art object, knowing the symbolic meaning will not mute the decrease in perceived value, because it still lacks the creator's agency control over the materialized expression.

To enhance credibility on the notion that even an assistant could gain full knowledge over the symbolic meaning or the aesthetic rule, we told subjects that both were described in the form of a mathematical equation. This means that for every copy, the agent could always go back to this mathematical 'source-code,' describing the symbolic meaning or the aesthetic rule. Otherwise, if the source is another painting, one might expect the artist to be better at extracting the symbolic essence.

Method

Participants and design

We recruited six hundred and sixty-six US adults (62% females; mean age = 37.09, *SD* = 12.61), through the same online panel as in the previous experiments, who participated in a series of unrelated studies in exchange for $1. To increase sample size and the likelihood that we would be able to recruit enough subjects, we collected the data in two waves of data collection. The results after the first wave did not differ from the results after including both waves. In a between-subjects full-factorial experimental design, we described the first-copy object (canvas) as either having a decorative motif (i.e., aesthetic property) or an art motif (i.e., symbolic property representing the creator's expression). Subjects then read that either the creator of the original or a skilled craftsman (who either did or did not have knowledge about the applied aesthetic rule or the symbolic meaning) made a second copy from the original. Across all conditions, we told participants that the original creator (artist) had first described the symbolic/artistic meaning/aesthetic solution into a mathematical equation, which he then transforms by hand-painting onto a canvas painting.

Participants read one of the following scenarios:

> *Art-object (symbolic object property) & Second copy made by creator of first copy.*
> Mathematics and art have a long historical relationship. Esmaim M. is a famous contemporary mathematical artist. He develops his artistic expression into a mathematical equation and then paints it onto canvas. Typically, he would only make one painting out of every unique equation, but this time, he decides to paint a second one that looks 100% identical to the first one.
>
> *Art-object (symbolic object property) & Second copy made by craftsman who knows symbolic meaning.*
> Mathematics and art have a long historical relationship. Esmaim M. is a famous contemporary mathematical artist. He develops his artistic expression into a mathematical equation and then paints it onto canvas. Typically, he would only make one painting out of every unique equation, but this time, he decides to paint a second one that looks 100% identical to the first one. To ensure that the second painting is 100% identical to the first one, he hires a highly skilled craftsman. He also makes

sure that the craftsman has perfect understanding of the symbolic meaning of every single element of the artwork when he paints it.

Art-object (symbolic object property) & Second copy made by craftsman who does not know symbolic meaning.
Mathematics and art have a long historical relationship. Esmaim M. is a famous contemporary mathematical artist. He develops his artistic expression into a mathematical equation and then paints it onto canvas. Typically, he would only make one painting out of every unique equation, but this time, he decides to make a second one from the same equation. To ensure that the second painting is 100% identical to the first one, he hires a highly skilled craftsman. The craftsman is not familiar with the symbolic meaning of the artwork.

Décor-object (aesthetic object property) & Second copy made by creator of first copy.
Mathematicians have for a long time tried to develop equations that describe and optimized principles of beauty and aesthetic. Such mathematical algorithms have been frequently applied to computer screen savers for example. Esmaim M. is a famous math scientist who specializes in the development of mathematical beauty algorithms. Besides that he is also a skilled motif-designer who would paint the aesthetic solution that he derives from the algorithm onto canvas. His paintings don't have any artistic meaning, but are solely meant for decoration and nice and beautiful to look at. Typically, he would only make one decorative painting out of every 'beauty-equation', but this time, he decides to paint a second one, which looks 100% identical to the first one.

Décor-object (aesthetic object property) & Second copy made by craftsman who knows aesthetic rule.
Mathematicians have for a long time tried to develop equations that describe and optimized principles of beauty and aesthetic. Such mathematical algorithms have been frequently applied to computer screen savers for example. Esmaim M. is a famous math scientist who specializes in the development of mathematical beauty algorithms. Besides that he is also a skilled motif-designer who would paint the aesthetic solution that he derives from the algorithm onto canvas. His paintings don't have any artistic meaning, but are solely meant for decoration and nice and beautiful to look at. Typically, he would only make one decorative painting out of every 'beauty-equation', but this time, he decides to paint a second one, which looks 100% identical to the first one. To ensure that the second painting is 100% identical to the first one, he hires a highly skilled craftsman. He also makes sure that the craftsman has perfect understanding of the mathematical principles behind the beauty equation.

Décor-object (aesthetic object property) & Second copy made by craftsman who does not know aesthetic rule.
Mathematicians have for a long time tried to develop equations that describe and optimized principles of beauty and aesthetic. Such mathematical algorithms have been frequently applied to computer screen savers for example. Esmaim M. is a famous math scientist who specializes in the development of mathematical beauty algorithms. Besides that he is also a skilled motif-designer who would paint the aesthetic solution that he derives from the algorithm onto canvas. His paintings don't have any artistic meaning, but are solely meant for decoration and nice and beautiful to look at. Typically, he would only make one decorative painting out of every 'beauty-equation', but this time, he decides to paint a second one, which looks 100% identical to the first one. To ensure that the second painting is 100% identical to the first one, he hires a highly skilled craftsman. The craftsman is not familiar with the mathematical principles behind the beauty equation.

Next, participants answered the following question: "Comparing the second canvas with the first canvas, how much is the second canvas worth?"

(1 = *a lot less than the first canvas*; 9 = *a lot more than the first canvas;* for data analysis, we converted the scale into a -4 to 4 scale, where 0 represents equal perceived value between the original and the duplicate).

Results and Discussion

We ran a set of three separate 2 X 2 ANOVAs to examine the nature of the interactions between our variables (see Figure 5).

First, we ran a 2 (type of object: art (symbolic) vs. décor (aesthetic)) x 2 (second copy produced by: creator of the original vs. craftsman who does not know the rule) analysis of variance (ANOVA) on perceived value (measured by the decrease in perceived value of the second copy in comparison to the first copy), and the interaction between the two factors was not significant, $F(1, 439) = 0.03$, $p = .86$, $\eta^2 = 0$. There was a significant main effect on the person who produced the second copy $F(1, 439) = 56.96$, $p = .0001$, $\eta^2 = 0.11$. Consistent with our predictions, both creator-made copies decreased less in perceived value (second copy art-object: $M = -0.18$, $SE = .12$, CI [-0.45, 0.09]; second copy decor-object: $M = -0.23$, $SE = .13$, CI [-1.7, -1.2]) than the craftsman-made copies (second copy art-object: $M = -1.22$, $SE = .14$, CI [-1.5, -1.0]; second copy decor-object: $M = -1.31$, $SE = .14$, CI [-1.6, -1.0]), and this is consistent with the account that only the creator of the first copy could re-apply the aesthetic rule, or perform another one-to-one materialized expression.

It is also important to point out that the perceived value for both creator-made second-copy objects had almost equal value compared to their first copies (0 represents identical value between the first and the second copy). This indicates that for our mechanism of valuation, it does not matter whether

there is only one of a kind or a series of objects or whether a certain copy is the first or the second. Also, we have strong evidence that our experimental procedure (i.e., measuring perceived value in relation to a comparison stimulus) was able to control for various other confounding variables, because there was no significant main effect on the object property variable. That is, the mean values between the second-copy art and the second copy décor objects were virtually identical, which is unlikely to happen when perceived value is measured in a direct way (e.g., “What is your perceived value of the second copy painting?”).

A 2 (type of object: art (symbolic) vs. décor (aesthetic)) x 2 (second copy produced by: creator of the original vs. craftsman who knows rule) analysis of variance (ANOVA) on our perceived value measure revealed a significant interaction between the two factors, $F(1, 440) = 6.73$, $p = .0098$, $\eta^2 = .01$ as well as a significant main effect on type of object property, $F(1, 443) = 5.17$, $p = .023$, $\eta^2 = .01$, and the type of person who produced the second copy $F(1, 440) = 42.04$, $p = .0001$, $\eta^2 = .09$. Again, creator-made copies decreased less in value (second copy art-object: $M = -0.18$; second copy decor-object: $M = -0.23$) than the craftsman-made copies (second copy art-object: $M = -1.37$, $SE = .13$, CI [-1.7, -1.2]; second copy decor-object: $M = -0.73$, $SE = .13$, CI [-1.0, -0.5]).

A planned contrasts analysis showed that the difference between both art and décor objects was not significant within the creator-made conditions $t(440) = 0.22$, $p = .41$, but this difference was significant within the craftsman conditions $t(440) = -3.45$, $p = .0003$, $d = .41$. Likewise, the decrease in perceived value was significantly less when the second copies were made by

the creator of the original objects compared to when they were made by the craftsman (for the second-copy décor objects: $t(440) = 2.70$, $p = .0035$, $d = .37$, and for the second-copy art objects: $t(440) = 6.52$, $p = .0001$, $d = .84$).

These findings are again consistent with our hypothesis. Knowing the aesthetic rule would allow the craftsman to produce a better quality second copy (whose perceived value should decrease less), but knowing the symbolic meaning would not be able to substitute the creator's materialized expression in the second object, because the materialized expression needs to contain the creator's mind. It is possible that the subjects felt that the décor-originals would also contain a small symbolic element and which a craftsman therefore could not embody in the second copy. This could explain why the second copy décor object has lower perceived value when it was produced by the craftsman compared to one produced by the creator (designer) of the original.

Finally, we ran a 2 (type of object: art (symbolic) vs. décor (aesthetic)) x 2 (second-copy produced by: craftsman who knows the rule vs. craftsman who does not know the rule) analysis of variance (ANOVA) on our perceived value measure, and the interaction between the two factors was again significant, $F(1, 441) = 5.20$, $p = .02$, $\eta^2 = .01$, but there were no significant main effects. This finding is again consistent with our theoretical framework and follows the same argumentation as provided for the previous two ANOVAs. A planned contrast analysis confirmed that the decrease in perceived value for the second-copy décor-object was significantly less ($t(441) = -2.57$, $p = .005$, $d = .41$) when the craftsman knows the rule as compared to if he does not know the rule. It was also significantly less if he

knows the aesthetic rule compared to when he knows the rule for the art-object ($t(441) = -2.83$, $p = .002$, $d = .40$). There were no other significant differences.

<Insert Figure 5>

Experiment 5: Valuation of a Fully Digitized Process of Materialization

It is common knowledge that art objects represent symbolic meaning (e.g. *Soda Can* = critique on consumerism). But as we showed in the previous experiment, knowing the symbolic meaning would not allow another person to produce a higher valued second copy (i.e., a copy with a lower decreased value) from an original artwork, because the other person could not produce the creator's materialized expression. This is why the copy produced by another person will be valued less than one made by the creator of the original. Likewise, second copy objects can have similar perceived value compared with the first copy when the artist produces both.

It is a major challenge for every theory of symbolic object valuation to explain the value of modern artwork, particularly when they are made out of mass-manufactured products that cannot be physically shaped (e.g., a urinal). In Experiment 5, we show that our theoretical framework can also account for these types of symbolic objects. To understand how the creator's expression is one-to-one materialized in objects of modern art (e.g., those made out of mass-manufactured products), we need to depict materialization as a concept that lies on a continuum. Materialization spans from rubbing oil-tinctured color particles onto canvas (painting), to making a collage picture from cut-out

newspaper images, to using 500 light bulbs to create a sculpture, to merely arranging, configuring, and hand-signing an existing mass-product. Hence, the one-to-one materialization of the creator's expression in the example of Duchamp's *Fountain* occurs when the artist configures the hand-signed urinal upside-down, mounts it on a stand and displays it at an exhibition. It then became clear that Duchamp was not engaged in some plumbing work, but that he used this particular object arrangement to embody his artistic expression.

To test our mechanism of valuation in the context of this particular category of symbolic objects we describe an entirely digitized process of object production where a painting called *Wave Formations* was fully drawn on computer and one original copy was printed onto canvas with a computer printer. The technological nature of the process allows the production of unlimited numbers of identical printouts, which is the same situation when modern artworks are made out of mass-manufactured products (e.g., one can buy hundreds of identical urinals). We again apply our relative valuation measure by asking subjects to rate the perceived value of a second copy in comparison to the first copy (i.e., the original). Following the logic of our theoretical framework, we expect the value of the second copy to be significantly below the value of the first copy because only the first copy object represents the creator's one-to-one materialized expression (which occurred in the moment it was first printed out). Instead, the second copy is just an identical machine-made copy of the first copy (if Duchamp bought another urinal from the store). In another condition, we apply the same value measure to a second-copy object, which the artist draws by hand (based on the printed

original). Perceived value for this hand-drawn duplicate should be close to the (printed) first copy, because then it represents another unique instance of the creator's materialized expression (as if Duchamp made a *Fountain* painting). Finally, we replicate both conditions, but this time, the second-copy objects were produced by an assistant (again either printed out or drawn by hand). As discussed in Experiment 4, a hand-drawn copy made by an assistant should be valued significantly less compared to its (printed) original as well as compared to a hand-drawn copy made by the creator of the (printed) original (compare procedure 1 vs. 3 in Table 1, p.10). However, when a second copy object is printed out, it should not affect perceived value whether the assistant or the artist made it, because pushing the print button would not affect the creator's materialized expression.

To control for the fact that the difference between artist- and assistant made hand-drawn duplicates is not attributable to the fact that one expects the artist to perform a more exact representation of the symbolic motif, we also manipulated the complexity of the motif, as well as the exactness of the representation of the motif. Both the motif-complexity and exactness of the representation should not affect our proposed valuation mechanism.

Method

Participants and design

We recruited six hundred and sixty-three US adults (62% females; mean age = 37.09, *SD* = 12.61) through the same online panel as in the previous experiments, who participated in a series of unrelated studies in exchange for $1. To increase sample size and the likelihood that we would be able to recruit enough subjects, we collected the data in two waves of data

collection. The results after the first wave did not differ from the results after including both waves. Participants were randomly assigned to one of the eight conditions in a 2 (producer of the duplicate (i.e., second copies): artist or assistant) X 4 (form of production: print vs. hand complex motif vs. hand simple motif vs. hand with deviance) between-subjects full-factorial experimental design.

Participants read one of the following scenarios:

Artist produces duplicate & Print (duplicate is printed).
Svena I. is a world-renowned Swedish painter who draws all her paintings purely on computer, but without ever allowing any software to modify or change what she has drawn. One of her paintings, called Wave Formations, has a very complex geometric motif (see picture above). The artist was inspired for this painting by wave formations she saw on a recent trip through the Australian Torrent Sea. It was drawn entirely on computer and then printed onto canvas. There exists only one copy from Wave Formations and it is valued at $100,000. However, the artist agrees to make an exact duplicate, so she re-prints another copy of Wave Formations. The duplicate looks identical in every way.

Artist produces duplicate & Hand complex motif (duplicate is hand-drawn).
Svena I. is a world-renowned Swedish painter who draws all her paintings purely on computer, but without ever allowing any software to modify or change what she has drawn. One of her paintings, called Wave Formations, has a very complex geometric motif (see picture above). The artist was inspired for this painting by wave formations she saw on a recent trip through the Australian Torrent Sea. It was drawn entirely on computer and then printed onto canvas. There exists only one copy from Wave Formations and it is valued at $100,000. However, the artist agrees to make an exact duplicate, so she hand-draws a second Wave Formations painting.

Artist produces duplicate & Hand deviate (duplicate is hand-drawn and shows slight deviation from the original).
Svena I. is a world-renowned Swedish painter who draws all her paintings purely on computer, but without ever allowing any software to modify or change what she has drawn. One of her paintings, called Wave Formations, has a very complex geometric motif (see picture above). The artist was inspired for this painting by wave formations she saw on a recent trip through the Australian Torrent Sea. It was drawn entirely on computer and then printed onto canvas. There exists only one copy from Wave Formations and it is valued at $100,000. However, the artist agrees to make a duplicate, so she hand-draws a second Wave Formations painting. This duplicate is extremely similar in every way, but experts would notice some very slight deviation from the first painting.

Assistant produces duplicate & Print (duplicate is printed).
Svena I. is a world-renowned Swedish painter who draws all her paintings purely on computer, but without ever allowing any software to modify or change what she has drawn. One of her paintings, called Wave Formations, has a very complex geometric motif (see picture above). The artist was inspired for this painting by wave formations she saw on a recent trip through the Australian Torrent Sea. It was drawn entirely on computer and then printed onto canvas. There exists only one copy from Wave Formations and it is valued at $100,000. However, the artist agrees to make an exact

duplicate, so she asks an assistant to re-print another copy of Wave Formations. The duplicate looks identical in every way.

Assistant produces duplicate & Hand complex motif (duplicate is hand-drawn).
Svena I. is a world-renowned Swedish painter who draws all her paintings purely on computer, but without ever allowing any software to modify or change what she has drawn. One of her paintings, called Wave Formations, has a very complex geometric motif (see picture above). The artist was inspired for this painting by wave formations she saw on a recent trip through the Australian Torrent Sea. It was drawn entirely on computer and then printed onto canvas. There exists only one copy from Wave Formations and it is valued at $100,000. However, the artist agrees to make an exact duplicate, so she asks an assistant to hand-draw a second Wave Formations painting.

Assistant produces duplicate & Hand deviate (duplicate is hand-drawn and shows slight deviation from the original).
Svena I. is a world-renowned Swedish painter who draws all her paintings purely on computer, but without ever allowing any software to modify or change what she has drawn. One of her paintings, called Wave Formations, has a very complex geometric motif (see picture above). The artist was inspired for this painting by wave formations she saw on a recent trip through the Australian Torrent Sea. It was drawn entirely on computer and then printed onto canvas. There exists only one copy from Wave Formations and it is valued at $100,000. However, the artist agrees to make an exact duplicate, so she so she asks an assistant to hand-draw a second Wave Formations painting. This duplicate is extremely similar in every way, but experts would notice some very slight deviation from the first painting.

The simple motif conditions (for both the Artist and Assistant duplicates) had the same text than for the complex motif (except for describing it as a simple motif), but displayed a different (=simpler) geometric art motif.

Next, participants answered the following question to indicate perceived value: “How much should the value of the duplicate painting be?” (1 = *a lot less than $100,000*; 9 = *a lot more than $100,000;* for data analysis, we converted this scale into a -4 to 4 scale, where 0 represents equal perceived value between the duplicate and the original).

Results and Discussion

We ran a set of several separate 2 X 2 ANOVAs to examine the nature of the interactions between our variables. Across all hand-drawn conditions (Figure 6), compared to their respective originals, the artist-made duplicates decreased less in value (complex motif: M = -0.64, SE = .20, CI [-1.1, -0.3]; simple motif: M = -1.1, SE = .20, CI [-1.6, -0.7]; complex motif with slight deviation from original: M = -0.8, SE = .20, CI [-1.3, -0.4]) than assistant-made

duplicates (complex motif: M = -2.2, SE = .20, CI [-2.7, -1.8]; simple motif: M = -2.44, SE = .20, CI [-2.9, -2.1]; complex motif with slight deviation from original: M = -2.21, SE = .21, CI [-2.7, -1.8]). There was no significant difference whether the printed duplicate was made by the artist (M = -1.75, SE = .21, CI [-2.2, -1.4]) or by the assistant (M = -1.67, SE = .20, CI [-2.1, -1.3]).

A 2 (producer of the duplicate: artist or assistant) X 2 (form of production: print vs. hand complex motif) analysis of variance (ANOVA) on our perceived value measure revealed a significant interaction between the two factors, $F(1, 332) = 16.11$, $p = .0001$, $\eta^2 = .04$ as well as a significant main effect on the person who produced the duplicate $F(1, 332) = 13.32$, $p = .0003$, $\eta^2 = .04$. A planned contrasts analysis showed the artist-made printed duplicate decreased more in perceived value than the artist-made hand-drawn duplicate ($t(332) = -3.81$, $p = .0002$, $d = .59$), but the assistant-made printed duplicate decreased less in perceived value than the assistant-made hand-drawn duplicate ($t(332) = 1.85$, $p = .03$, $d = .28$). The artist-produced hand-drawn duplicate decreased less in perceived value than the assistant-produced ($t(332) = 5.46$, $p = .0001$, $d = .82$), but there was no difference between the printed duplicates.

The ANOVA on 2(producer of the duplicate: artist or assistant) X 2(form of production: print vs. hand simple motif) replicated the previous findings ($F(1, 327) = 11.76$, $p = .0007$, $\eta^2 = .03$ for the interaction and ($F(1, 327) = 9.43$, $p = .002$, $\eta^2 = .03$ for the main effect) and so did the ANOVA on 2(producer of the duplicate: artist or assistant) X 2(form of production: print vs. hand deviate from original), ($F(1, 322) = 12.76$, $p = .0004$, $\eta^2 = .03$ for the interaction and ($F(1, 322) = 10.34$, $p = .001$, $\eta^2 = .03$ for the main effect).

Planned contrasts for both ANOVAs showed the same pattern as the one described above with the complex motif. Other ANOVAs of interest [2(artist vs. assistant) X 2(hand-complex vs. hand-simple); 2(artist vs. assistant) X 2(hand-complex vs. hand-deviate); 2(artist vs. assistant) X 2 (hand-simple vs. hand-deviate)] showed only main effects (*p*s < .0001) on the producer of the duplicate variable.

<Insert Figure 6>

The results, in our opinion, provide the strongest test for our main account, namely that valuation as a function of the one-to-one materialization of the creator's expression also occurs in symbolic objects, which could be identically reproduced in unlimited numbers (e.g., mass-products used for works of modern art). The mechanism can best be understood when looking at the finding that perceived value had decreased more when the artist made the print-duplicate compared to when she made the duplicate by hand. First of all, the results indicate that the print duplicates were not perceived as simple printouts from a low quality artwork, because then their perceived value should be closer to 0 (i.e., we would expect the original and the duplicate of a low quality artwork to have similar perceived value). Instead, the print-duplicates had substantially lower perceived value than their originals, which confirms what we had explained with objects of modern art such as Duchamp's urinal. That is, urinals are mass-manufactured products which could be purchased in unlimited numbers, and the same applies to fully digitized motifs from which one could print out copies in any desired number

(with identical quality). But in the same way that Duchamp's urinal was arranged to become a piece of art (i.e., *Fountain*), our original print-out (in the context it was described) became a piece of art with the intention to embody the creator's expression. That is, the artist first digitally represented his or her expression by drawing a visual motif and then this became one-to-one embodied in the original printout (i.e., it became an end-statement). Hence, a second printout would be of lower perceived value, because it is simply a machine-made copy from the artist's material end-statement (created in the moment it was first printed out). Of equal interest is the finding that the decrease in perceived value was the same for the assistant-made print-duplicate. Since both the artist- and assistant-made print duplicates do not represent the creator's expression, the person who produced these duplicates should not affect their perceived value. This means that when the technological procedure allows for unlimited and identical duplication (as is the case with buying urinals or printing unlimited copies), the perceiver needs to understand that an object was made with the intention to represent the creator's one-to-one materialized expression. Such information would naturally be present when the artist made a hand-duplicate, because then it would be perceived as another version of *Wave Formations* (like a painting made from Duchamp's *Fountain* sculpture). Another option would be when the artist draws a second symbolic motif and prints it out.

As expected, in the hand-made conditions, the assistant-made duplicates had lower perceived value compared to the artist-made duplicates. Of particular interest here are the findings that the difference between artist- and assistant-made duplicates was largely identical across all hand-made

conditions. This shows that valuation in the context of our framework does not depend on how accurate the symbolic motif is transformed into the object.

It is also important to point out that our results could not be explained by uniqueness, because the assistant-made hand-drawn duplicates were also unique. Additionally, the fact that we did not find any difference between the simple and the complex motifs would go strongly against creativity as a possible driver of valuation. Even though we did not measure perceived level of creativity, the simple motif appears almost trivial as compared to the complex motif (see pictures of our motif stimuli in the online appendix) and would most likely be rated as much less creative. Finally, the findings would also contradict the contagion hypothesis because the artist-made hand-drawn copies had lower perceived value than the assistant-made hand-drawn duplicates.

Our findings appear to provide converging evidence that in the context of our theoretical framework, valuation does not depend on whether an object is made by the artist or an assistant or whether it is labeled as first or second copy or as a duplicate. It also does not depend on how accurate the symbolic motif has been transformed into the material object, and whether the object was produced through traditional hand-production or through modern digital technology. Instead, the production procedure affects our mechanism of valuation when it allows the creator to have agency control over the one-to-one materialized expression in the object.

General Discussion

We began this manuscript by describing the observation that in most cultures and markets, hand-made objects have higher perceived value even

though their functional performance might be inferior to ones made by machines. We then argued that this can be explained by one underlying driver for symbolic material object valuation: The one-to-one materialization of the creator's unique personal expression in the particular object. And we further argued that this form of isomorphic transformation of the act of creation into a singular object can explain why many of our most valuable material objects share phenomenological characteristics, such as being hand-made, being an original, and that their motifs have been designed by human beings rather than made by a computer algorithms or machines.

Furthermore, we specified that our proposed mechanism consists of two main factors: (1) the salience of the object's symbolic object property, and (2) the perception of agency control over the creator's one-to-one materialized expression. We empirically tested this in a series of six experimental studies. Experiments 1a and 1b demonstrated that the perception of one-to-one materialization was hampered once there is some intervention (i.e., standardization of the result) that affected the final version of the materialized expression. These experiments also showed that such intervention would not affect valuation when the object is not symbolic, but had mainly functional or aesthetic quality. A mediation analysis confirmed that this process of symbolic object valuation was driven by the perception of the creator's expression. Experiment 2 provides further insights into the mechanism by manipulating the source of the human and symbolic expression (i.e., artist versus algorithm). In Experiments 3 and 4 it was shown that the process of materialized expression could not be explained by a contagion effect. It was also shown that our mechanism of valuation is independent from the object's

symbolic meaning or how much the agent knows about the symbolic meaning. Experiment 5 provides specific insights into how our mechanism applies to modern artworks, and to processes that allow unlimited production of identical duplicates.

Alternative Explanations and Limitations

Although the above listed phenomena are readily observable in the real world, the mechanism is not immediately intuitive and has not been theorized by past psychological research. Typically, past research has treated such phenomena of valuation separately, offering a variety of explanations such as perceived uniqueness (e.g., Tian et al. , 2001; Snyder & Fromkin, 1980), aesthetic appeal (e.g., Augustin, Leder, Hutzler, & Carbon, 2008; Ramachandran, 2001; Reber et al., 2004), creativity (e.g. Newman & Bloom, 2012), effort (e.g., Kruger, Wirtz, Van Boven & Altermatt, 2004), scarcity (e.g. Verhallen, 1982; Verhallen & Robben, 1994; Lynn, 1991) or the amount of physical contact (Newman & Bloom, 2012; Newman et al., 2011). We argue that these factors could not account for the entire series of results presented in our six experimental studies. More specifically, across many of our conditions, we kept factors such as effort or physical contact constant. For example, in Experiments 1a, 1b and 2, the objects had the same amount of physical contact from the creator. Experiment 3 specifically addressed that physical contact is just one way of ensuring the creator's (e.g., artist's) one-to-one materialized expression. We also consider it as implausible that it would require more effort to create a symbolic object as compared to a functional or aesthetic object. Several of our experiments showed that the difference cannot be attributed to the level of aesthetic appeal (cf. Experiments 1b, 4,

and 5) because perceived appeal by definition cannot differ as a function of whether it is perceived from an original or perceived from an identical duplicate. Furthermore, we do not believe that the difference between symbolic and non-symbolic (or art versus non-art) objects would depend on the level of creativity or creative performance (Newman & Bloom, 2012). It involves a much higher level of creativity when making an original as compared to a duplicate. However, it is not likely that making a series of mouth-blown wine glasses or a painting would necessarily require a higher level of creativity than inventing a highly innovative technological object such as a well-functioning stone axe, the first plough, or modern high-tech devices. Consistent with our results, we argue that the underlying driver of value here is about the creator's unique expression and not creativity, though the former would also involve the latter. Finally, we also do not think that our results could be explained by perceived uniqueness or scarcity, or that very complex and creative shapes would be more difficult to reproduce. In some of our experiments (1a, b, 2), we have measured perceived scarcity and including this factor into our statistical analyses did not affect our results. In Experiment 1b, we manipulated three object properties (functional, aesthetic, symbolic), only in the symbolic quality condition was perceived value affected by agency control. In Experiment 2, we showed that unique objects would have less value when they do not contain a human expression because they were made by a computer algorithm. More specifically, Experiments 4 and 5 are inconsistent with the alternative explanations of scarcity or problems with reproducibility of complex and creative motifs. In these experiments, we had shapes with varying degrees of complexity across all conditions. Above all, if

duplicates from symbolic objects would decrease more in perceived value because they are harder to reproduce, then we should have seen a difference between the magnitude of decreases in perceived value of creator-made aesthetic and symbolic object duplicates. Likewise, these experiments also ruled out the lay-theoretic explanation that objects of art would be perceived as inheriting a certain 'aura' or spirit via the fact they were either labeled as art or made by an artist who is perceived as a human being with special abilities. Again, one might be tempted to label art objects or hand-made originals as more 'unique'. But as we explained in the introduction, this form of 'uniqueness' is inconsistent with psychological theories of uniqueness, which have their application in the context of group and social identities. For example, if I am surrounded by people with green T-shirts, I should be better able to satisfy my need for uniqueness by wearing a machine-made red T-shirt than with a hand-made green T-shirt. We leave it to future research to connect our theoretical mechanism with a novel construct of 'human uniqueness'.

Regarding the experimental stimuli, we used descriptions of objects (with accompanying visual images) rather than the object itself. There are several reasons why we think this does not pose serious problems for testing our story. First, even real-life auctions at Sotheby's and Christie's use descriptions of the objects, and, just like our stimulus materials, are accompanied by the visual images. So our experiments are ecologically valid with regards to the valuation processes that actually occur at auction houses such as Sotheby's and Christie's. Second, our goal is to measure the participant's perceived value of the object, rather than their purchase

intention, because our participants have average incomes and modest budgets, making it difficult for them to generate a real purchase intention for expensive items such as art and sculpture.

Overall, we believe that our empirical studies provide solid evidence that our proposed theoretical framework of valuation constitutes a universal and core mechanism to help us understand the process of valuation for a major class of symbolic material objects. We have also demonstrated the universal applicability of this mechanism by empirically testing it in the context of various possible forms of symbolic object production (i.e., one or many motifs onto one or many objects, produced by hand or machine; produced by the creator of the original or another person). Related to that, we also outlined how the mechanism of valuation relates to objects of modern art or forms of digital production.

Conclusion

One of our intentions was to suggest that psychological valuation for material objects such as art and symbolic artifacts comes from a core psychological mechanism that is based on our species' unique relationship with material objects. In this sense, material art objects do in fact differ from other forms of arts such as the performing arts (music, dance, theatre) or literature. Our proposed mechanism only applies to the former because, by definition, it requires a material object. Even though pieces of performing arts could be described in a material object (e.g., the musical score written down by the composer), this description does not contain the creator's (one-to-one) expression, which only occurs in the moment when this person performs the expression in real time on stage. So although paintings would constitute

material end-statements, this is not possible with a musical performance, because by definition, it only occurs in the transient moment of the performance. The musical score is therefore something similar to the mathematical equation containing the symbolic meaning that we used for Experiment 4. Indeed, if the artist had purposely stopped at this point, then every person could use the equation and transform it into his/her very individual material end-statements, because the creator never produced a materialized original. Although these symbolic objects made by end-consumers would not contain the artist's one-to-one materialized expression, it would be the end-consumer's materialized expression. Note that recording a musical performance on a CD would not fall into this category, because it would only be a recorded observation of a particular performance (just like video-taping an artist who draws a painting).

A potential direction for future research would be to examine differences between symbolic material objects that have mainly idiosyncratic value (e.g., my firstborn's drawing), and those that have value for the entire humanity (e.g., Lascaux cave paintings, Sistine chapel frescos). Furthermore, it would be interesting to look into the mechanism that determines how symbolic material objects maintain their value over time. Whereas the value for functional objects would depend on whether they maintain their function, making it difficult for functional objects to retain their value over long periods of time, the value of symbolic objects is not only sustained over time, it might even increase significantly. Another interesting direction for future research might be to further examine psychological (valuation) processes of creator-made duplicates. For example, are duplicates made by the creator considered

as completely different instances of expression, or do they constitute revivals or reinterpretations of past experiences?

In 1976, the American philosopher Nelson Goodman explained in his book *Languages of Art* that art is a system of symbols that refer to a core of representations, yet the symbols do not possess these representations. Considered one of the most important works of 20th century aesthetics, Goodman's work sets the philosophical foundation for the research that we presented here. Yet, our suggested mechanism goes beyond valuation that results from purely idiosyncratic processes, or mainly singular objects such as works of art. By identifying the relationships between two core factors (symbolic object property and the creator's materialized expression), we provide a first attempt at identifying the universal psychological mechanisms for explaining judgments of value for perhaps the most uniquely human category of symbolic material objects, and we hope this sheds insight into one of the most fundamental psychological processes of our human species.

References

Augustin, M. D., Leder, H., Hutzler, F., & Carbon, C. C. (2008). Style follows content: On the microgenesis of art perception. *Acta Psychologica*, *128*(1), 127-138. http://dx.doi.org/10.1016/j.actpsy.2007.11.006

Bandura, A. (2000). Exercise of human agency through collective efficacy. *Current Directions in Psychological Science*, 9, 75–78. http://dx.doi.org/10.1111/1467-8721.00064

Bandura, A. (2006). Toward a psychology of human agency. *Perspectives on Psychological Science* 1: 2. http://dx.doi.org/10.1111/j.1745-6916.2006.00011.x

Belk, R. (1988). *Possessions and self*. John Wiley & Sons, Ltd.

Belk, R. W., Wallendorf, M., & Sherry Jr, J. F. (1989). The sacred and the profane in consumer behavior: Theodicy on the odyssey. *Journal of Consumer Research*, 1-38.

Benjamin, W. (1936/1968), *The work of art in the age of mechanical reproduction*. *Illuminations* Hannah Arendt, ed., London: Fontana

Berger, J., & Heath, C. (2007). Where consumers diverge from others: Identity signaling and product domains. *Journal of Consumer Research*, 34, 121-134.

Berger, J., & Heath, C. (2008). Who drives divergence? Identity signaling, outgroup dissimilarity, and the abandonment of cultural tastes. *Journal of Personality and Social Psychology*, *95*(3), 593. http://dx.doi.org/10.1037/0022-3514.95.3.593

Bullot, NJ. & Reber, R. (2013). The artful mind meets art history: Toward psycho-historical framework for the science of art appreciation. *Behavioral and Brain Sciences*, 36, 123-180. http://dx.doi.org/10.1017/S0140525X12000489

Cheng, J. T., Tracy, J. L., Foulsham, T., Kingstone, A., & Henrich, J. (2013). Two ways to the top: Evidence that dominance and prestige are distinct yet viable avenues to social rank and influence. *Journal of Personality and Social Psychology*, *104*(1), 103. http://dx.doi.org/10.1037/a0030398

Danto, A. (2013), *What art is.* Yale University Press.

Gell, A. (1998). *Art and agency: An anthropological theory.* Oxford University Press.

Glimcher, P. W. (2010). *Foundations of neuroeconomic analysis*. Oxford University Press.

Goodman, N. (1976). *Languages of art*. Hackett Publishing Company.

Grandy, R. E. (2007). Artifacts: Parts and principles. *Creations of the mind: Theories of artifacts and their representation*, 18-32.

Henshilwood, C.S., & Marean, C.W. (2003). The origin of modern human behavior: Critique of the models and their test implications. *Current Anthropology*, 44/5, 627-651.

Henrich, J., & McElreath, R. (2003). The evolution of cultural evolution. *Evolutionary Anthropology: Issues, News, and Reviews*, *12*(3), 123-135. http://dx.doi.org/10.1002/evan.10110

Higgins, E. T. (2006). Value from hedonic experience and engagement. *Psychological Review*, 113(3), 439-460. http://dx.doi.org/10.1037/0033-295X.113.3.439

Higgins, E. T. (2007). Value. *Social psychology: Handbook of basic principles*,*2*, 454-472.

Humphrey, N. (2007). The society of selves. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *362*(1480), 745-754. http://dx.doi.org/10.1098/rstb.2006.2007

Knight, C., Power, C., & Watts, I. (1995). The human symbolic revolution: a Darwinian account. *Cambridge Archaeological Journal*, *5*(01), 75-114. http://dx.doi.org/10.1017/S0959774300001190

Kreuzbauer, R. (2002). *Design and brand: The influence of product form on the formation of brands*. Dt. Univ.-Verlag.

Kruger, J., Wirtz, D., Van Boven, L., & Altermatt, T. W. (2004). The effort heuristic. *Journal of Experimental Social Psychology*, 40, 91–98. http://dx.doi.org/10.1016/S0022-1031(03)00065-9

Leonardelli, G. J., Pickett, C. L., & Brewer, M. B. (2010). Optimal distinctiveness theory: A framework for social identity, social cognition, and intergroup relations. *Advances in Experimental Social*

Psychology, *43*, 63-113. http://dx.doi.org/10.1016/S0065-2601(10)43002-6

Lynn, M. (1991). Scarcity effects on value: A quantitative review of the commodity theory literature. *Psychology & Marketing*, *8*(1), 43-57. http://dx.doi.org/10.1002/mar.4220080105

Malafouris, L. (2013). *How things shape the mind*. MIT Press.

Mauss, M. (1954). *The gift: Forms and functions of exchange in archaic societies* (No. 378). WW Norton & Company.

Muller, D., Judd, C. M., & Yzerbyt, V. Y. (2005). When moderation is mediated and mediation is moderated. *Journal of Personality and Social Psychology*, 89, 852–863. http://dx.doi.org/10.1037/0022-3514.89.6.852

Newman, G. E., Diesendruck, G., & Bloom, P. (2011). Celebrity contagion and the value of objects. *Journal of Consumer Research*, *38*(2), 215-228.

Newman, G. E., & Bloom, P. (2012). Art and authenticity: The importance of originals in judgments of value. *Journal of Experimental Psychology: General*, 141/3, 558-569. http://dx.doi.org/10.1037/a0026035

Nöth, W. (1995). *Handbook of semiotics*. Indiana University Press.

Preacher, K. J., Rucker, D. D., & Hayes, A. F. (2007) Addressing moderated mediation hypotheses: Theory, methods, and prescriptions. *Multivariate Behavioral Research*, 42, 185–227. http://dx.doi.org/10.1080/00273170701341316

Ramachandran, V. S. (2001). Sharpening up the science of art. *Journal of Consciousness Studies*, *8*(1), 9-29.

Reber, R., Schwarz, N., & Winkielman, P. (2004). Processing fluency and aesthetic pleasure: is beauty in the perceiver's processing experience? *Personality and Social Psychology Review*, *8*(4), 364-382. http://dx.doi.org/10.1207/s15327957pspr0804_3

Simmons J.P., Nelson L.D. & Simonsohn U. (2011). False-positive psychology: undisclosed flexibility in data collection and analysis allows presenting anything as significant. *Psychological Science*, 22(11) 1359 –1366. http://dx.doi.org/10.1177/0956797611417632

Simonsohn, U. (2014, March 12). *No-way interactions*. Data Colada (blog post). Retrieved April 4, 2015 from http://datacolada.org. http://dx.doi.org/10.15200/winn.142559.90552

Simonsohn, U., Nelson, L. D., & Simmons, J. P. (2014). P-curve: A key to the file-drawer. *Journal of Experimental Psychology: General*, *143*(2), 534. http://dx.doi.org/10.1037/a0033242

Snyder, C. R., & Fromkin, H. L. (1980). *Uniqueness: The human pursuit of difference*. New York: Plenum Press.

Tian, K. T., Bearden, W. O., & Hunter, G. L. (2001). Consumers' need for uniqueness: Scale development and validation. *Journal of Consumer Research*,*28*(1), 50-66.

Tomasello, M. (2014a). The ultra-social animal. *European Journal of Social Psychology, 44*, 187-194. http://dx.doi.org/10.1002/ejsp.2015

Tomasello, M. (2014b). *A natural history of human thinking*. Harvard University Press.

Van Lange, P., Balliet, D. P., Parks, C. D., & Van Vugt, M. (2013). *Social dilemmas: Understanding human cooperation*. Oxford University Press.

Verhallen, T.M., (1982). Scarcity and consumer choice behavior. *Journal of Economic Psychology*, 2, p. 299-322.

Verhallen, T. M., & Robben, H. S. (1994). Scarcity and preference: An experiment on unavailability and product evaluation. *Journal of Economic Psychology*, *15*(2), 315-331. http://dx.doi.org/10.1016/0167-4870(82)90034-4

Vignoles, V. L., Regalia, C., Manzi, C., Golledge, J., & Scabini, E. (2006). Beyond self-esteem: influence of multiple motives on identity construction. *Journal of Personality and Social Psychology*, *90*(2), 308. http://dx.doi.org/10.1037/0022-3514.90.2.308

Wadley, L. (2001). What is cultural modernity? A general view and a South African perspective from Rose Cottage Cave. *Cambridge Archaeological Journal*, *11*(02), 201-221. http://dx.doi.org/10.1017/S0959774301000117

Table

Procedure 1 One clay-version represents the creator's materialized expression (e_1), which is later transformed by machine or another person into three marble blocks X, Y, Z. The machine or the other person transforms e_1 into three different marble blocks: Xe_1, Ye_1, Ze_1
Procedure 2 Three clay-versions represent the creator's three materialized expressions (e_1, e_2, e_3), which are later transformed by machine or another person into three marble blocks X, Y, Z. The machine or the other person assists in transforming e_1, e_2, e_3 into three different marble blocks: Xe_1, Ye_2, Ze_3 (i.e. three 'end-statements')
Procedure 3 One clay-version serves as a prototype for the creator's expression (e), which provides an orientation for the three materialized expressions (e_1, e_2, e_3) that are created and materialized during the moment of shaping the three marble blocks X, Y, Z. Again they become three material end-statements: Xe_1, Ye_2, Ze_3
Explanation: Procedures 2 and 3 show how our mechanism of agency control applies to these most common forms of art or symbolic artifact creation (especially when the creator makes an entire series). Through procedure 2 the creator creates three materialized expressions in clay (i.e. three material 'end-statements'). Machines or other people merely assist during production. Through procedure 3 the creator creates three different materialized expressions during the shaping of the three marble blocks.

Table 1. Agency control over the one-to-one materialized expression applied to common procedures (2 and 3) of art and symbolic artifact production/creation.

Figures

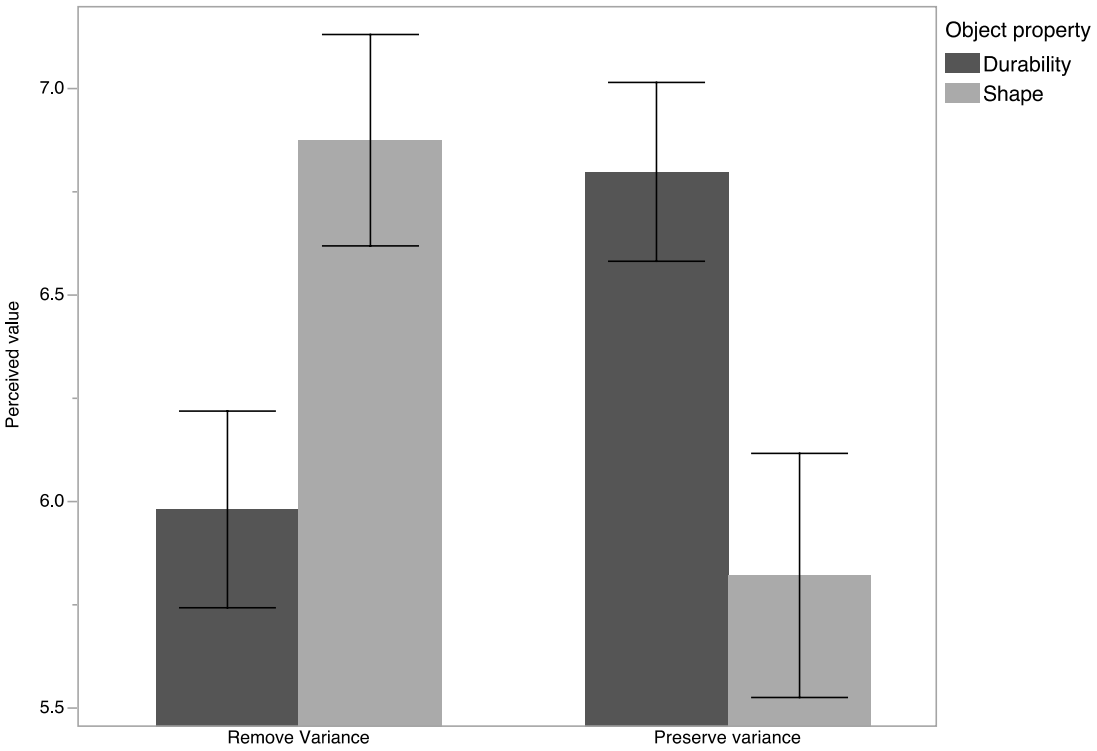

Figure 1. Mean perceived value in Experiment 1a as a function of type of object property (functional (durability)/symbolic (shape)) and agency control over the transformation (preserve or remove variance). Error bars represent standard errors.

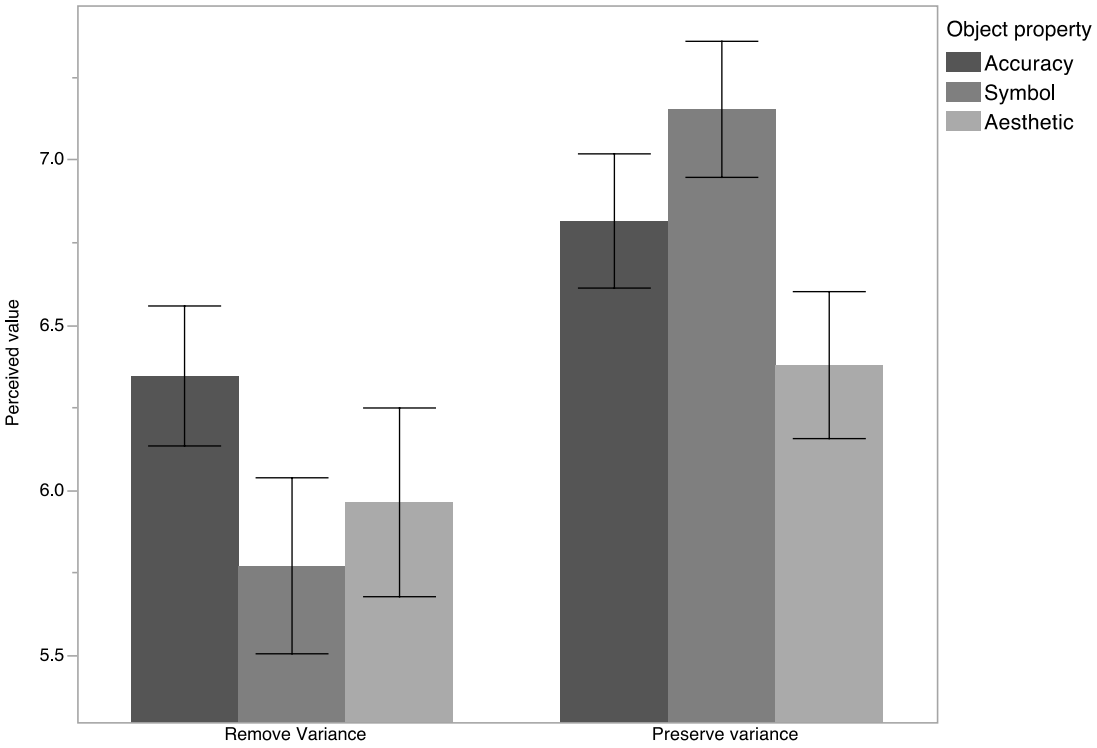

Figure 2. Mean perceived value in Experiment 1b as a function of type of object property (functional (accuracy)/symbolic (symbol)/aesthetic) and agency control over the transformation (preserve or remove variance). Error bars represent standard errors.

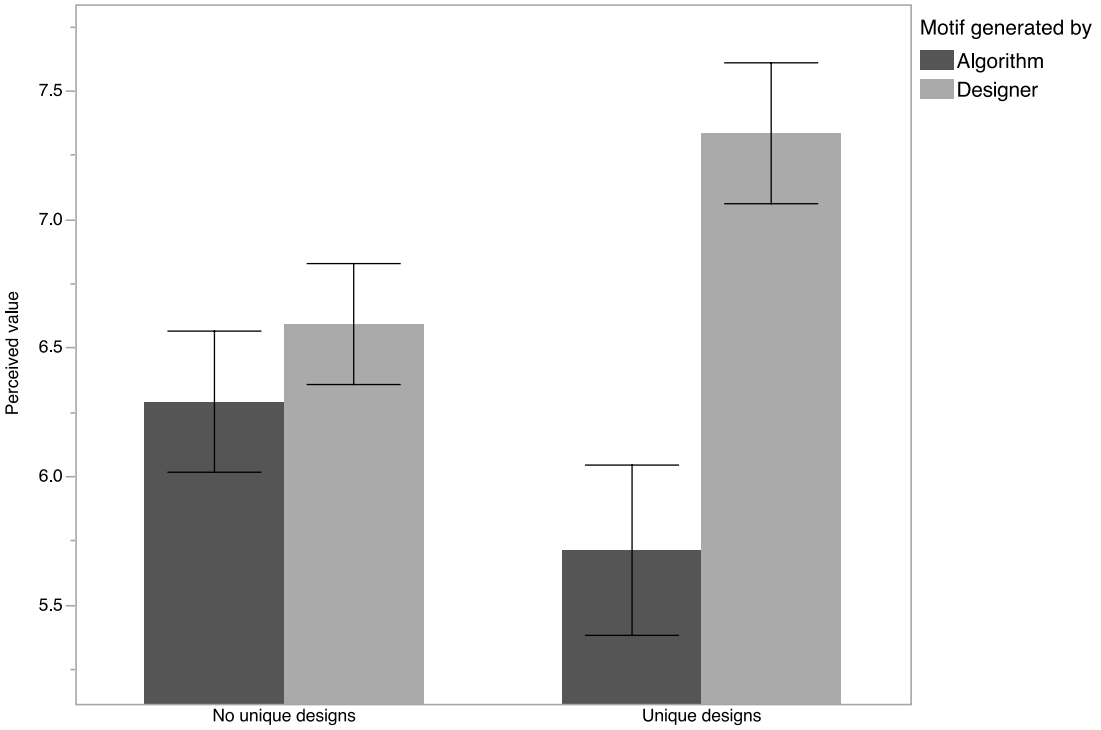

Figure 3. Mean perceived value in Experiment 2 as a function of form of production (designer/algorithm) and uniqueness. Error bars represent standard errors.

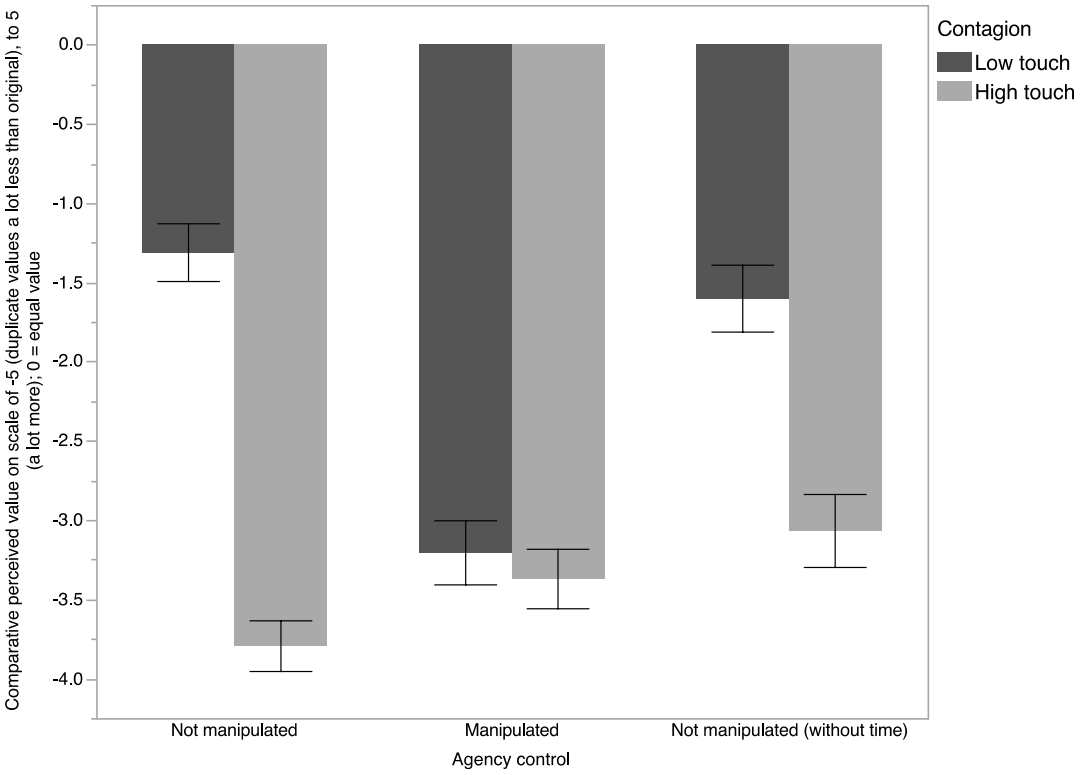

Figure 4. Comparative perceived value on a scale of -5 (duplicate values a lot less than original), to 5 (duplicate values a lot more than original), whereby 0 represents equal perceived value between duplicate and original. Length of the bars indicates the decrease in perceived value of a duplicate compared to its respective original as a function of agency control (either additionally manipulated or because of a level of psychological contagion). Error bars represent standard errors.

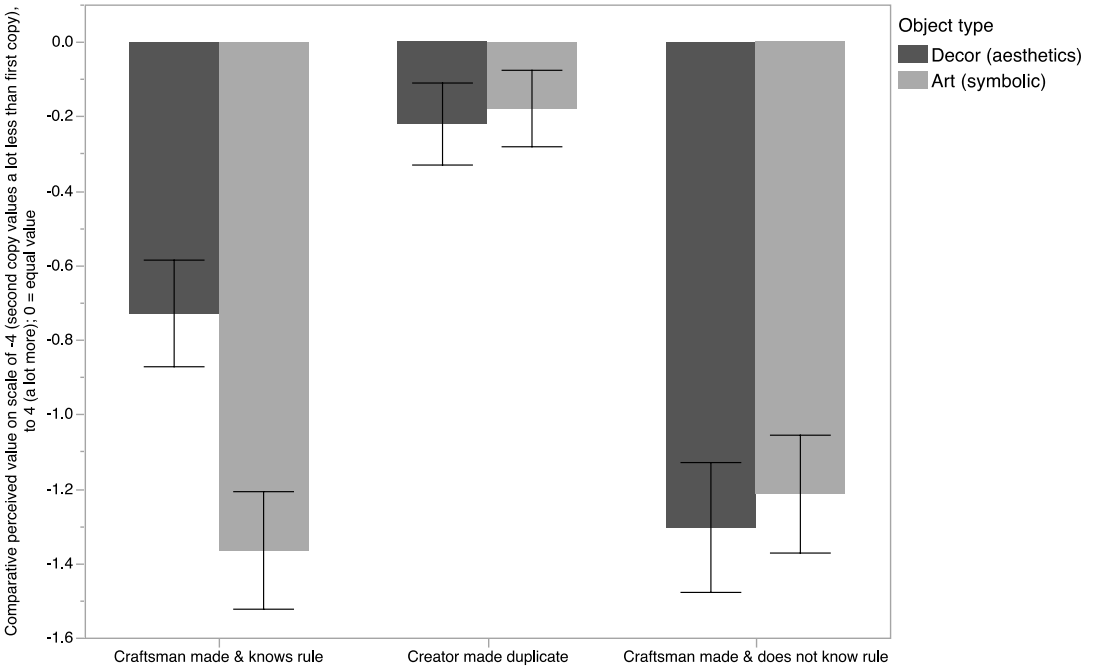

Figure 5. Comparative perceived value on a scale of -4 (second copy values a lot less than first copy), to 4 (second copy values a lot more than first copy), whereby 0 represents equal perceived value between both copies. Length of the bars indicates the decrease in perceived value of a second copy compared to its respective first copy as a function of type of object (art vs. decor) and second copy produced by (the creator of the original; a craftsman who knows the rule; and a craftsman who does not know the rule for the art/décor motif). Error bars represent standard errors.

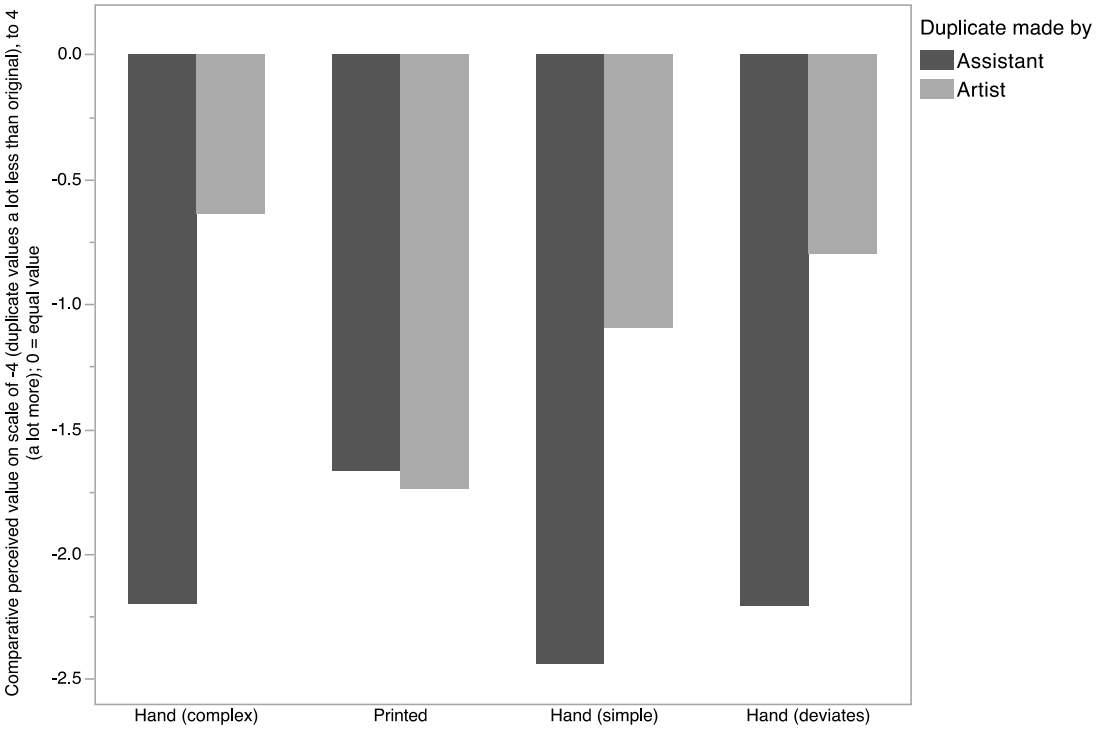

Figure 6. Comparative perceived value on a scale of -4 (duplicate values a lot less than original), to 4 (duplicate values a lot more than original), whereby 0 represents equal perceived value between duplicate and original. Length of the bars indicates the decrease in perceived value of a duplicate compared to its respective original as a function of the person who produced the duplicate (artist vs. assistant) and the form of production (print; hand-drawn complex motif; hand-drawn simple motif; hand-drawn (deviates slightly from original)). Error bars represent standard errors.