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Junwei Yu, Olivier Droulers, Sophie Lacoste-Badie

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## **Why display motion on packaging? The effect of implied motion on consumer behavior**

Junwei YU

PhD student

IGR-IAE Rennes | Graduate School of Management

Université Rennes, CNRS, NeuroLab CREM (Center for Research in Economy and Management) - UMR 6211, Rennes, France

[junwei.yu@univ-rennes1.fr](mailto:junwei.yu@univ-rennes1.fr)

Olivier DROULERS

Professor of Marketing (PhD; MD)

IGR-IAE Rennes | Graduate School of Management

Université Rennes, CNRS, NeuroLab CREM (Center for Research in Economy and Management) - UMR 6211, Rennes, France

[olivier.droulers@univ-rennes1.fr](mailto:olivier.droulers@univ-rennes1.fr)

Sophie LACOSTE-BADIE (**contact author**)

Professor of Marketing (PhD)

IAE Lille University School of Management

Université Lille, Lille University Management Lab (LUMEN), France

[sophie.lacoste-badie@univ-lille.fr](mailto:sophie.lacoste-badie@univ-lille.fr)

# **Why display motion on packaging? The effect of implied motion on consumer behavior**

**Abstract:** Visual packaging elements play a crucial role in influencing consumer behavior in stores. Front of pack (FOP) formats frequently present images of the product in motion (i.e., implied motion), especially in food categories. Despite the popularity of implied motion in real-world business, little research has been done to understand its effect on consumer behavior. To fill this gap, the present study adopts an evolutionary lens to investigate the impact of implied motion as a packaging design technique on consumers' attention, product evaluation, purchase intention and choice. We carried out two experiments using realistic milk and orange juice packaging. Specifically, Experiment 1 was conducted in a lab using an eye tracking method to provide an objective measure of attention. The findings show that implied motion significantly increases visual attention and consequently generates more frequent choices. Using an online experimental design and declarative measures, Experiment 2 indicates that implied motion also enhances freshness, which translates into greater tastiness, product attractiveness and, ultimately, purchase intention. The study provides marketers with an inexpensive yet efficient way to enhance in-store marketing performance by incorporating implied motion into the FOP design.

**Key words:** implied motion, packaging, eye tracking, consumer behavior, attention, product evaluation, purchase, evolutionary psychology

**Paper type:** Research paper

# Why display motion on packaging? The effect of implied motion on consumer behavior

## Introduction

Both marketing academics and professionals acknowledge that, in addition to its traditional function in logistics and distribution, packaging serves as an important communication tool (Dubin, 2014; Robertson, 2016). It is physically more accessible at the time of purchase and consumption than other forms of communication (Chandon, 2013; Underwood and Klein, 2002), and is thus a useful device to attract attention, set positive expectations, enhance the general consumption experience and trigger purchase behavior (Gidlöf et al., 2017; Lee et al., 2019; Krishna et al., 2017; Togawa et al., 2019; Van der Lans et al., 2008). As a result, a growing body of research has explored different packaging design techniques to study their effects on various aspects of consumer behavior. Certain features of packaging design, such as contrast, simplicity and novelty, for instance, have been shown to influence consumer attention in a cluttered environment (Clement et al., 2013; Schoormans and Robben, 1997). Packaging materials and graphic features have also been found to influence consumers' product evaluation and purchase intention (Bone and France, 2001; Lick et al., 2017; Sung et al., 2020). Additionally, a recent study suggested that aesthetically appealing shipping packages can enhance consumer loyalty (Schnurr and Wetzels, 2020). Despite growing research endeavors, studies on the effects of implied motion (i.e., the ability shared by all humans to perceive dynamic events depicted in still images; Shirai and Imura, 2016) remain scarce. While Cian et al. (2014) investigated the impact of dynamic logos on consumer engagement, a more recent study by Gvili et al. (2017) examined the influence of food photos depicting implied motion. However, to the best of our knowledge, implied motion has not previously been studied as a packaging design technique, despite the fact that it is frequently used on various packages, especially for food products. For example, on milk and juice packaging, liquids may be depicted as being poured into a glass, bubbles may explode and spread across packages of sparkling water, and even solid products, such as crackers, may be seen jumping in the air. According to Creusen and Schoormans (2005, p.68): *"when a product stands out visually from competitive products, chances are higher that consumers will pay attention to the product in a purchase situation, as it 'catches their eye'."* Incorporating implied motion into the FOP design could be an effective way to capture consumer attention at the point of sale, which is the first step to a product purchase. Combining the literature in evolutionary psychology and marketing, and using objective (eye tracking) and declarative measures, the present study contributes to the marketing literature by examining the effects of implied motion as a packaging design technique

on different aspects of consumer behavior, integrating these aspects into an overall model. It also gives manufacturers and retailers an inexpensive yet effective way to increase consumer attention and enhance product evaluation in a highly cluttered in-store environment, which consequently translates into greater purchase intention.

The remainder of the paper is structured as follows. First, we review the relevant literature regarding the potential impact of implied motion as a packaging design technique on consumer behavior. We then present the methodology, the experiment design and the findings from two experiments. We conclude with a discussion of the theoretical contributions and the managerial implications of the present study, as well as its limitations and avenues for future research.

## **2. Theoretical background, conceptual model, and hypotheses**

To examine how packaging impacts in-store consumer behavior, some researchers have focused on packaging design, adopting either a holistic approach that considers the package as a whole (Orth and Malkewitz, 2008), or an analytic approach that examines the influence of one (or sometimes many) attributes of the packaging in question (Pinto and Droulers, 2010). In the latter approach, the influence of shape (e.g., Raghurir and Krishna, 1999; Krider et al., 2001), size (e.g., Folkes et al., 1993; Wansink, 1996), texture (Spence and Gallace, 2011; Zampini et al., 2006), and color (e.g., Garber and Hyatt, 2003; Pelet et al. 2020; Rouillet and Droulers, 2005), for example, have been taken into consideration. Other researchers have investigated the placement of products, arguing that there is an optimal shelf location and a positive relationship between the number of facings and consumer responsiveness (Atalay et al., 2012; Chandon et al., 2009). Deng et al. (2016) also found that shelf disposition (vertical vs. horizontal) influences in-store processing fluency and choice. However, to our knowledge, the effect of implied motion has not previously been studied in the packaging-related literature.

### *2.1. Influence of implied motion on consumers' attention and choice*

Motion is experienced as a perceptible change in location (Radden, 1996). It is ubiquitous and is the most apparent characteristic of life (Volland and Grammer, 2003). Throughout the evolutionary history of humans, detecting animate entities in the visual field (e.g., prey and predators) has been a crucial survival mechanism (Pratt et al., 2010). Consequently, various types of motion, ranging from the simplest kinematic motion to more complex biological motion, attract and retain visual attention, even when

individuals are mentally occupied with a primary task (Bardi et al., 2011). Intriguingly, motion can be static. In other words, a sense of motion can be implied by a static image (Cutting, 2002). Recruiting neural substrates shared with actual motion processing and knowledge of previously learned motion patterns, implied motion can instantly create a spontaneous perception of motion (Freyd, 1983; Kourtzi and Kanwisher, 2000). Packaging can easily incorporate implied motion by adding images of products in motion to FOP (e.g., snack packaging often displays snacks jumping in the air). Since motion is fundamentally important for survival, the attention-capturing effect of real movement is very likely to be generalized to implied motion displayed on product packaging. Some evidence for this has been reported in psychology. For instance, the direction of various forms of implied human motion has been found to guide the subsequent visual attention of both infants (Shirai and Imura, 2016) and adults (Gervais et al., 2010). In marketing, one study showed that logos displaying implied motion and presented in a schematic print advertisement hold more attention (Cian et al., 2014). Based on the notion found in evolutionary psychology that movement attracts attention (Pratt et al., 2010; Spence, 2018), together with initial results in the fields of psychology and marketing, we thus hypothesize that:

**H1a.** Implied motion displayed on product packaging (vs. no implied motion) will increase visual attention to the product.

Several studies have pointed to a positive link between attention and choice. Marketing studies using both one-way mirrors (Russo and Leclerc, 1994) and eye tracking (Pieters and Warlop, 1999) found that the products most likely to be chosen are those which attract the most attention. Clement et al. (2015, p.189) observed that people tend to better evaluate and prefer products that attract longer gaze time (also see Krajbich et al., 2010). Recent studies in the field of retail and packaging have confirmed this link (Gidlöf et al., 2017; Peschel et al., 2019; Van Loo et al., 2020). Therefore, we hypothesize that:

**H1b.** Increased visual attention on product packaging will generate greater product choice.

Moreover, some studies have also highlighted the mediating role of attention in consumer choice processes. Zhang et al. (2009) found that visual attention mediates the effects of several ad design characteristics (e.g., advertisement surface size) on sales. In a retail context involving the impact of a product's shelf position on choice, Atalay et al. (2012) found that the duration of fixations is the only mediator with a significant indirect impact on choice, while Bialkova et al. (2014) found that attention mediates

the effect of FOP nutrition labels on choice. Based on the above theoretical foundations, we therefore hypothesize that:

**H1c.** The relationship between implied motion displayed on product packaging and product choice will be mediated by visual attention on product packaging.

## *2.2. Influence of implied motion on consumers' evaluations and purchase intention*

Implied motion displayed on packaging is very likely to enhance consumers' food evaluations. Early industrial insights argue that in the eyes of consumers, freshness means "close to the original form", and that the two main components involved in the concept of freshness are related to sensory properties (e.g., texture and appearance) and time from harvest (Péneau et al., 2007). A recent study that recruited Chinese-immigrant consumers suggested that the freshness-closeness association is largely culture-independent (Zhang et al., 2016). Once an animal/plant is dead/harvested, its freshness deteriorates rapidly with time (Singh and Cadwallader, 2003). The ultimate closeness to food's original status is the moment just before it is hunted or gathered, when organisms are still moving and alive. Consequently, using motion as a heuristic indicator of food freshness is supported by evolution since it is timely and metabolically efficient (Buss, 2015). That is why some fine-dining restaurants set up ornamental glass tanks with live fish to emphasize freshness (Campbell-Smith, 1970). Recently, simple photos of beverages pouring into a glass were found to highlight food freshness (Gvili et al., 2017). The marketing literature suggests that consumers automatically integrate packaging-induced inferences into their evaluation of product content (Krishna et al., 2017). Thus, it is likely that the motion-freshness association holds true even in the form of motion implied on product packaging. We therefore hypothesize that:

**H2a.** Implied motion displayed on product packaging (vs. no implied motion) will enhance freshness.

Consumers' food evaluation reflects adaptive problems faced by human ancestors (Buss, 2015). In other words, characteristics contributing to survival – such as fresher food - are evaluated more positively (Feather et al., 1998; Volland and Grammer, 2003). More specifically, consumers perceive fresh food to be tastier as it has a better-preserved physical structure, more nutrients and less bacterial contamination compared to non-fresh food (Singh and Cadwallader, 2003). In line with the evolutionary rationale, freshness and tastiness are closely related concepts, jointly influencing consumers' evaluation and choice of food and restaurants (Konuk, 2019; Ragaert et al., 2004; Wandel and Bugge, 1997). Marketing studies suggest that consumers typically take freshness as a diagnostic cue for tastiness (Krishna and Morrin, 2008). For example, a

field experiment found that chips packaged in hard-to-open bags generate enhanced gustatory experience, probably because consumers believe that such packages preserve the chips' freshness better (McDaniel and Baker, 1977). More solid evidence comes from recent marketing experiments which reported a positive effect of freshness on perceived food tastiness (Gvili et al., 2017; Kunz et al., 2020). Hence, we hypothesize that:

**H2b.** Freshness will enhance tastiness.

In addition to freshness and tastiness, attractiveness is also a critical dimension of food evaluation. An evolutionary view suggests that the tastiness of food will make it more attractive to individuals since this mechanism helped human ancestors to evaluate food items and seek out better food sources (Wang et al., 2018). Consistent with the evolutionary rationale, consumers nowadays draw on a food item's sensory and hedonic properties, especially taste, to determine its attractiveness (Bargh, 2002; Piech et al., 2009). Recently, Schlinkert et al. (2020) suggested that enhanced tastiness tends to make a snack more attractive to average consumers. Thus, we hypothesize that:

**H2c.** Tastiness will enhance product attractiveness.

Based on the theoretical foundations set out above, we further hypothesize that:

**H2d.** The relationship between implied motion displayed on product packaging and product attractiveness will be serially mediated by freshness and tastiness.

If implied motion displayed on packaging enhances consumers' product evaluations, it should consequently boost purchase intention. Individuals activate approaching behavior when faced with an attractive object as it is associated with higher survival value (e.g., more nutrients) (Wang et al., 2018). In the field of marketing, the hierarchy of effects model argues that developing a positive product evaluation is a customary precondition for activating purchase behavior (O'Shaughnessy and O'Shaughnessy, 2003). Likewise, product attractiveness has been identified as a major predictor of consumer purchase (Chan et al., 2010). Recent experiments have shown that product attractiveness can significantly enhance purchase intention for both food and non-food products (Orth and Crouch, 2014; Schnurr et al., 2017). Consequently, we hypothesize that:

**H3.** Product attractiveness will increase consumers' purchase intention.

In the current study, two experiments were conducted to test these hypotheses. Experiment 1 is a lab experiment designed to examine how implied motion displayed on product packaging influences consumers' attention and choice. An eye-tracking



method was used to provide an objective measure of consumers' visual attention. Experiment 2 is an online experiment which used declarative measures to examine the influence of implied motion on consumers' product evaluations (freshness, tastiness, product attractiveness) and purchase intention. The experiments were conducted in accordance with the principles expressed in the Declaration of Helsinki for studies on human subjects.

Figure 1 presents the analysis framework.

**Insert Figure 1 about here**

### **3. Experiment 1 - Influence of implied motion on consumers' attention and choice**

To investigate the influence of implied motion on consumers' attention and choice, a between-subjects design was adopted (implied motion condition vs. no implied motion condition). As visual attention deployment is typically unconscious (Holmqvist et al., 2011) and cannot be reliably approximated by a memory test (Atalay et al., 2012), an eye-tracking method is useful for attention-related studies (Mormann et al., 2020). Accordingly, Experiment 1 used eye tracking to provide an objective measure of visual attention.

#### *3.1. Participants*

Sixty-three adults (41 female, 22 male: 34 students, 29 workers) aged between 18 and 56 years ( $M = 22.37$ ,  $SD = 4.98$ ) were recruited via an email invitation to randomly selected contacts from a university list composed of current students and alumni from diverse educational fields (e.g., biology, public health, law, management, etc.) and from programs of various levels. When a positive reply was received, the participant was given an appointment for the lab experiment. At the end of the experiment, the volunteers were offered a snack (cereal bar or small bottle of fruit compote) as a symbolic gift for taking part in the experiment.

#### *3.2. Apparatus*

The participants were seated facing a 24" (52 cm x 32.5 cm) Hewlett Packard screen, in front of which a binocular remote corneal reflection eye-tracking system had been

installed (SensoMotoric Instruments (SMI) RED 250). They were positioned about 70 cm from the screen so that the on-screen product packaging size matched the real packaging size as far as possible. The sampling rate of 250 Hz meant that the points of regard were captured every 4 milliseconds (ms). The experiment was conducted via the SMI Experiment Center (Version 3.7.68). Standard velocity-based thresholds of the SMI BeGaze Software (Version 3.7.58) were used for event detection (velocity-threshold for saccade detection: 40°/s). In the current study, fixations were defined by an absence of saccades and blinks for at least 50 ms. The data were exported using SMI BeGaze.

### *3.3. Stimuli and pretest*

Orange juice was selected as the product category for the experiment since it is widely consumed by both genders of all ages in the country where the experiment was conducted (France). To avoid familiarity bias, all the brand names were chosen so as to be unknown to participants, since they were either not marketed in the country or were fictitious. In order to construct a mini-shelf, we asked a design agency to create four FOPs (three distractors and one target). For the target brand (Sunswee), the agency was asked to design two versions of the FOP, one with an image of the product in motion (implied motion condition) and one with a static product image (no implied motion condition) (see Figure 2). The four FOPs displayed the same set of information items (five in total) selected from the most frequently displayed items in a real-life situation, such as product category name (i.e., “Orange juice”), brand (e.g., “Sunswee”), a single product characteristic (e.g., “pulp free”), a slogan (e.g., “a smooth and mellow taste”), and the weight or volume (e.g., “1 liter”).

A pretest with 23 participants (who differed from the participants in the main experiment) was conducted to see if the manipulation was effective. We asked the participants to answer the question: “how much motion did you see on the product packaging?” (perceived motion scale adapted from Cian et al., 2014, 1 item, 9-point scale, no motion=1, motion=9). The results showed that the orange juice FOP displaying implied motion was considered to be more in motion than the orange juice FOP with no implied motion ( $M_{IM} = 7.91$ ,  $SD = .99$ ,  $M_{noIM} = 2.72$ ,  $SD = 1.42$ ,  $t(21) = -10.21$ ,  $p = .000$ ), suggesting that our implied motion manipulation was effective.

**Insert Figure 2 about here**

### *3.4. Procedure*

The participants were welcomed to the laboratory individually by a research assistant and randomly assigned to one of the two conditions. After being informed of the eye-tracking procedure and having given their written consent, the participants were seated facing a screen where they first performed a calibration procedure (tracking a moving red dot on the screen) that enables the eye-tracking system to precisely localize eye position and ensures reliable eye movement recordings. This step was successfully completed by all the participants. An on-screen text then informed them that the experiment was part of a test for new products that were likely to be launched on the market in the near future. To get close to a real situation of selecting a product from a shelf, the participants were shown a mini-shelf displaying four orange juice FOPs. The target stimulus was surrounded by three unknown brand distractors and placed to center left or center right by random assignment (Figure 3). The participants were asked to look at the mini-shelf as if they were planning to make a purchase in this category in a real store, and to indicate which brand they would choose. A practice trial using a similar mini-shelf (cookies) was arranged prior to the main trial to familiarize the participants with the requested task. To mimic natural choice conditions, no time constraint was imposed. After the eye-tracking recording, the participants were re-exposed to the target stimulus in order to complete control questions to ascertain perceived motion (“how much motion did you see on the product packaging?”: 9-point scale, adapted from Cian et al., 2014), product category involvement (“it is/is not a product category I am interested in; it is/is not a product category that I value”:  $\alpha = .829$ ; 9-point scale, adapted from Strazzieri, 1994), and product consumption frequency (“how often do you consume orange juice?”, anchored by “once a day or more, 2-3 times a week, once a week, once every 2 or 3 weeks, once a month, once every 2 or 3 months, less frequently, never”, adapted from Bix et al., 2013). Following some demographic questions (age, gender, working status, education), the respondents were debriefed, thanked for their time and invited to choose a snack as a symbolic gift.

**Insert Figure 3 about here**

### *3.5. Results*

#### *3.5.1. Preliminary results*

For between-group measures, after looking for potential sources of bias, no violations of assumptions were noted. Tests comparing mean and standard deviations of individual variables were performed to verify comparability of the two experimental groups. For all the variables examined (i.e., age, gender, working status, education,

product category involvement and product consumption frequency), no significant differences were found between the two experimental groups ( $p > .05$ ).

### 3.5.2. Manipulation check

In line with the pretest (perceived motion scale), the orange juice FOP displaying implied motion was perceived as being more in motion than the orange juice FOP displaying no implied motion ( $M_{IM} = 7.50$ ,  $SD = 1.74$ ,  $M_{noIM} = 3.32$ ,  $SD = 2.42$ ,  $t(54) = -7.82$ ,  $p = .000$ ), confirming that our implied motion manipulation was successful.

### 3.5.3. Gaze analysis

The image of the product on the FOP was defined as the area of interest (AOI) for the gaze analysis. We measured attention devoted to the AOI using four indicators: number of eye fixations (fixation count, FC), total duration of the fixations (fixation time, FT), total duration of saccades and fixations (dwell time, DT), and first fixation duration (FFD) (Carter and Luke, 2020).

### 3.5.4. Main results

Participants' age, gender, working status, education, product category involvement and product consumption frequency, as well as the position of the product packaging (center left or center right), were used as covariates, but were dropped from the reported analyses as they did not statistically influence the results.

Student's two-sample independent t-tests explained attention to the product image using an indicator of implied motion (1 implied motion, 0 no implied motion) as the explanatory variable (Table 1). In the implied motion condition, participants made significantly more FC on the image of the product ( $p = .033$ ) on average and spent significantly longer FT on the product image ( $p = .032$ ) compared to the no implied motion condition. DT and FFD were also significantly higher in the implied motion condition than in the no implied motion condition (respectively  $p = .047$  and  $p = .044$ ). These findings provide support for H1a.

**Insert Table 1 about here**

The mean fixation time on each product packaging was 2.46 seconds ( $SD = 2.24$ ) and the participants took an average of 12 seconds to choose a product. The descriptive statistics show that product packaging with implied motion was selected more often than product packaging without implied motion (6 times vs. twice).

To analyze the influence of implied motion and attention on product choice, we used a logistic regression. In the first logistic regression (Table 2, left side), excluding attention to product image, the implied motion indicator had no significant impact on product choice ( $b = 1.17, p = .17$ ) when controlling for position (position has no impact). A second regression added attention (FT measure) to the product image as an explanatory variable (Table 2, right side). The impact of the implied motion indicator remained non-significant ( $b = .56, p = .54$ ), while attention to the product image exerted a significant positive effect on choice ( $b = .00, p = .007$ ). The findings were similar when the logistic regression analyses were replicated using FC or DT as the measure of visual attention. Thus, product packaging displaying implied motion does not directly increase choice probability but generates more attention to the product image (H1a supported), and therefore heightens product choice likelihood (H1b supported). In other words, the positive effect of implied motion on choice was totally mediated by increased attention to the product image, revealing an “indirect-only mediation” (Zhao et al., 2010) (H1c supported).

**Insert Table 2 here**

## **4. Experiment 2 - Influence of implied motion on freshness, tastiness, product attractiveness, and purchase intention**

To investigate the influence of implied motion on freshness, tastiness, product attractiveness, and purchase intention, a between-subjects design was used, as in Experiment 1 (implied motion condition vs. no implied motion condition). Declarative measures were adopted to collect data. To improve the generalizability of the findings, a different product (milk) was selected.

### *4.1. Participants*

One hundred and thirty-two adults (66 female, 66 male: 28 students, 104 workers) aged between 18 and 54 years ( $M = 28.23, SD = 7.96$ ) took part in the online experiment. The recruitment process was similar to that used in Experiment 1. One difference was that after acquiring a participant’s agreement, a questionnaire was sent to the volunteer by email. The participants agreed to take part in the experiment with no reward.

### *4.2. Stimuli and pretest*

Milk was selected as the product for the experiment because, like orange juice, it is widely consumed by both genders of all ages in the country where the experiment was conducted (France). To avoid familiarity bias, a brand (Alpina) not marketed in the country was chosen and a design agency was asked to create two versions of the FOP, one with the image of the product in motion (implied motion condition) and one without motion (no implied motion condition) (see Figure 2).

A pretest with 29 participants (who differed from the participants in the main experiment) was conducted to see if the manipulation was effective. We asked the participants to answer the following question: “how much motion did you see on the product packaging?” (perceived motion scale, adapted from Cian et al., 2014, 1 item, 9-point scale, no motion=1, motion=9). The results showed that the FOP displaying implied motion was perceived as being more in motion than the FOP displaying no implied motion ( $M_{IM} = 7.35$ ,  $SD = 1.82$ ,  $M_{noIM} = 3.93$ ,  $SD = 2.31$ ,  $t(27) = -4.40$ ,  $p = .000$ ). These findings indicate that our implied motion manipulation was effective.

### *4.3. Procedure*

The participants were randomly assigned to one of the two conditions and received the questionnaire by e-mail. A text informed them that the experiment was part of a test for a new product that was likely to be available on the market in the near future. They were then shown one of the two versions of the FOP (implied motion condition vs. no implied motion condition) and were asked to look at the milk FOP as if they were planning to make a purchase in this category in a real store. Questions were asked to measure purchase intention (“how likely is it that you will buy this product?”; Chang and Wildt, 1994), tastiness (how tasty is this product?; adapted from Gvili et al., 2017), product attractiveness (how attractive is this product?; adapted from Page and Herr, 2002), and freshness (how fresh is this product?; adapted from Gvili et al., 2017). Perceived motion, product category involvement, product consumption frequency and common demographic features were also measured in the same way as in Experiment 1. All these variables, except for product consumption frequency, were measured on a 9-point scale. The question order was carefully constructed to reduce forced-correlation bias.

### *4.4. Results*

#### *4.4.1. Preliminary results*

After looking for potential sources of bias, no assumption violations were noted for the between-group measures. Tests comparing mean and standard deviations of

individual variables were performed to verify comparability of the two experimental groups. For all the variables examined (i.e., age, gender, working status, education, product category involvement and product consumption frequency), no significant differences were found between the two experimental groups ( $p > .05$ ).

#### 4.4.2. Manipulation check

In line with the pretest (perceived motion scale), the FOP displaying implied motion was perceived as being more in motion than the FOP displaying no implied motion ( $M_{IM} = 6.60$ ,  $SD = 2.22$ ,  $M_{noIM} = 2.74$ ,  $SD = 1.87$ ,  $t(130) = -10.73$ ,  $p = .000$ ), confirming that our implied motion manipulation was successful.

#### 4.4.3. Main results

Participants' age, gender, working status, education, product category involvement, and product consumption frequency were used as covariates, but were dropped from the reported analyses as they did not statistically influence the results.

Independent t-tests revealed that implied motion displayed on product packaging had a positive and significant effect on freshness  $t(121) = -3.88$ ,  $p = .000$  (H2a supported). Table 3 also highlights a positive and significant effect on product attractiveness  $t(130) = -3.35$ ,  $p = .001$ . However, the effect on tastiness was not significant  $t(130) = -1.89$ ,  $p = .061$ .

### **Insert Table 3 here**

To test the mediating effect of freshness and tastiness on the relationship between implied motion and product attractiveness, we used the PROCESS Multiple Mediation Model 6 (bootstrapping of 5000 resamples) (Hayes, 2017). The results show that while freshness mediates the impact of implied motion on product attractiveness ( $b = .67$ ,  $SE = .20$ ,  $95\%CI = [.34; 1.17]$ ), tastiness does not ( $b = .05$ ,  $SE = .18$ ,  $95\%CI = [-.31; .41]$ ). Freshness has a positive impact on tastiness ( $b = .32$ ,  $SE = .06$ ,  $p = .000$ ) (H2b supported), and tastiness has a positive impact on product attractiveness ( $b = .56$ ,  $SE = .09$ ,  $p = .000$ ) (H2c supported). The indirect effects of implied motion on product attractiveness through freshness and tastiness were significant and positive ( $b = .25$ ,  $SE = .13$ ,  $95\%CI = [.07; .59]$ ). The direct effect of implied motion on product attractiveness was not significant ( $b = .36$ ,  $SE = .30$ ,  $p = .236$ ). Thus, H2d, which predicted that freshness and tastiness serially mediate the effect of implied motion on product attractiveness, is supported, with the experiment revealing an "indirect-only mediation" (Zhao et al., 2010) (Figure 4 and Table 4).

## **Insert Table 4 and Figure 4 here**

In addition, the results of the linear regression indicate that purchase intention increases significantly and positively with product attractiveness ( $b = .76$ ,  $p = .000$ , Adjusted  $R^2 = .54$ ). Thus, H3 is supported.

### **5. General discussion**

In this study, two experiments were conducted to investigate the effect of implied motion as a novel packaging design technique. We found that implied motion has a positive effect on multiple aspects of consumer behavior. Specifically, an eye-tracking experiment showed that displaying implied motion on product packaging can significantly increase consumers' visual attention, even when their visual field is loaded with dense information (e.g., the mini-shelf stimuli). A subsequent online experiment further revealed that implied motion enhances freshness, which consequently translates into greater tastiness and then product attractiveness. Finally, we found that increased attention to implied motion (i.e., product image area) translates into final choice (Experiment 1) and that enhanced product evaluation produces stronger purchase intention (Experiment 2). Our study indicates that implied motion is a promising packaging design technique, at least for food products placed in a cluttered retailing environment.

#### *5.1 Theoretical contributions*

First, our findings contribute to the existing literature on packaging and in-store consumer behavior. Although implied motion has been widely adopted in real-world packaging design, no previous studies have investigated its functionality. While some marketing research has examined the effect of implied motion in a non-packaging context (Gvili et al., 2017), the present study is the first, to our knowledge, to investigate implied motion in the context of product packaging. More importantly, we measured different aspects of consumer behavior and included them in a model to illustrate the underlying process of the effect of implied motion. Our model suggests that implied motion increases visual attention in a cluttered environment, which is further utilized by consumers to decipher persuasive messages, thereby yielding enhanced product evaluation and enhanced purchase intention.

Second, the present study also indicates that evolutionary psychology offers a convincing and powerful theoretical framework for food marketing in general. Our



theoretical framework and hypotheses are primarily underpinned by an evolutionary perspective. For example, we have developed acute visual sensitivity to (implied) motion due to the fact that prey and predators move. Similarly, as fresh prey moves before being hunted, we use (implied) motion to help us judge food freshness and other critical criteria in an efficient way. Researchers recently advocated adopting the evolutionary framework in the science and practice of marketing (Saad, 2020), although use of the evolutionary lens is relatively scarce in the marketing literature. Some pioneering psychologists and marketing scholars have begun to apply an evolutionary view to understand key components of consumer behavior (Hartmann and Apaolaza-Ibanez, 2010; for a review, see Saad, 2013). However, little, if any, attention has been paid to how an evolutionary mindset can benefit food marketing. Our findings demonstrate that evolutionary psychology can offer a powerful perspective to understand consumers' food preference and that it can also help us to discover new ways to market food products. As hunting, gathering and eating are fundamental activities of our human ancestors, we have developed many psychological mechanisms over the course of our evolutionary history to help us detect and choose the best foods in a highly complex environment (Buss, 2015). These mechanisms constitute an instrumental repertoire for food marketing research, as demonstrated by the present study. Such mechanisms, including the motion-related attention and inference we explored, usually function in a spontaneous fashion. Thus, they can be applied to naturally and effectively communicate product values.

## *5.2 Managerial implications*

The present study provides several insights for manufacturers. Brands compete for consumers' limited attention, with most products completely ignored by consumers (Clement et al., 2013). A product's in-store visibility is conventionally improved by increasing the number of facings or choosing an optimal shelf location (Chandon et al. 2009). However, such methods involve high costs linked to negotiations with the retailer. They may even be impossible at times as retailers in Europe tend to reserve their optimal locations for store brands only (Gómez and Okazaki, 2008). Recent research has shown that FOP design can serve as an alternative option to increase consumers' visual attention (Lacoste-Badie et al., 2020). In line with this observation, the present study found that displaying implied motion on a product's FOP attracts consumers' visual attention. Displaying implied motion on packaging is fully under the manufacturer's control and financially viable. Consequently, manufacturers can utilize implied motion as an important packaging design tool to increase products' in-store saliency. The present study also indicates that implied motion can communicate

positive product attributes, which potentially make a product more attractive and generate higher purchase intention. Thus, implied motion can also be used as an affordable supplement to in-store promotion techniques such as signage (Otterbring et al., 2014) to increase product evaluation and generate more sales. It should also be noted that some packaging design techniques can come at a cost. For example, using a highly novel design may catch attention, but can also reduce consumers' positive packaging evaluation (Schoormans and Robben, 1997). However, since the present study demonstrated a broad-spectrum positive effect of implied motion on different aspects of consumer behavior, it is less likely to generate negative side effects.

### *5.3 Limitations and future research*

This study has some limitations that also represent opportunities for future research. First, as the study only examines the impact of implied motion with liquid foods (milk and orange juice), it would be interesting to extend it further by examining the effect of implied motion with solid foods. Splashing effects, as used on orange juice packaging, would be difficult to reproduce with solid foods. Consequently, other visual cues such as blurred images, action lines, affine shear, instability, superimposition and stroboscopic images could be used in future research to represent implied motion (Osaka, et al., 2010). Second, in the current study we used food products in which freshness is a major attribute, and we demonstrated the positive impact of showing the product with implied motion. We believe it is important to examine this aspect with other products where freshness is not naturally such an important factor (e.g., canned vegetables) to assess whether implied motion conveys the same positive effect on the product's evaluation. Third, unknown brands were used in the current study to promote internal validity. Recent research has shown that male and female may react differently when faced with known or unknown brands (Karpinska-Krakowiak, 2021). We thus suggest replicating the current research using known brands to examine whether the effects we found with unknown brands still hold with known brands. Fourth, each brand conveys a specific positioning, with tradition-based positioning commonly adopted for food products. Since tradition implies stability (Cian et al., 2014), it is possible that the use of implied motion on a FOP could be counterproductive in this specific case. Identifying such boundary conditions would enhance our understanding of the way implied motion is processed.

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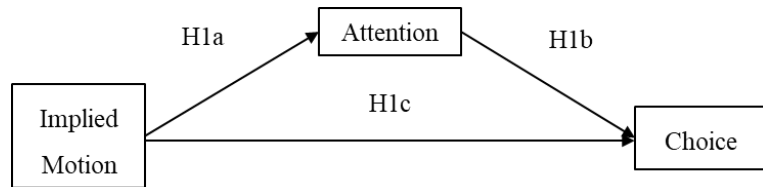
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**Figure 1. Conceptual models**

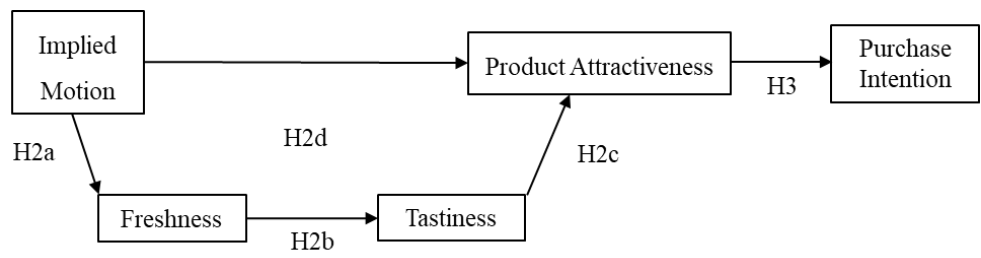
Experiment 1

*Objective  
measures*

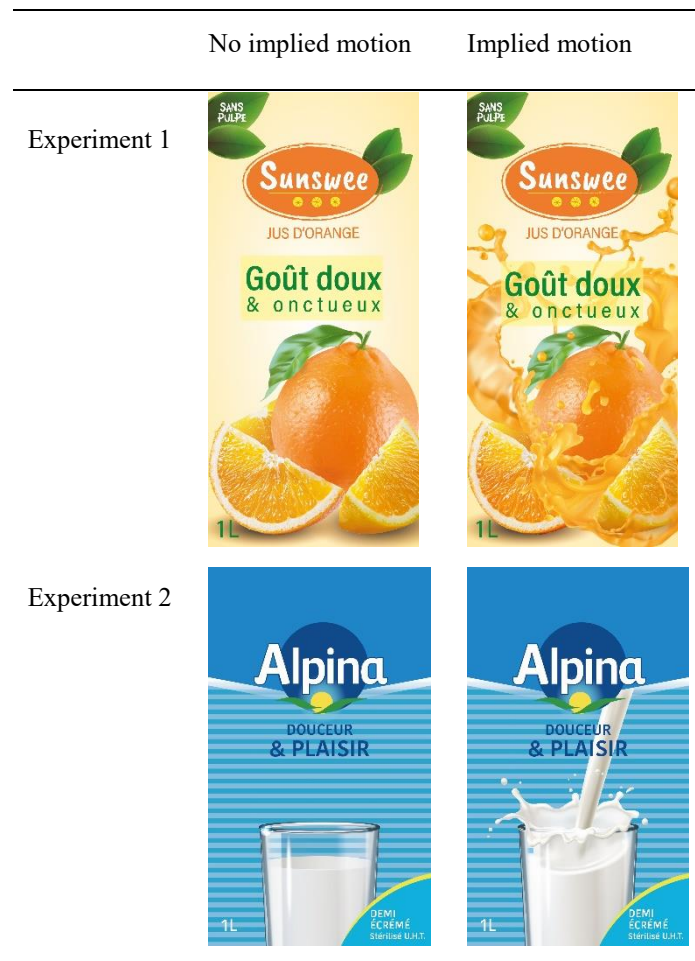


Experiment 2

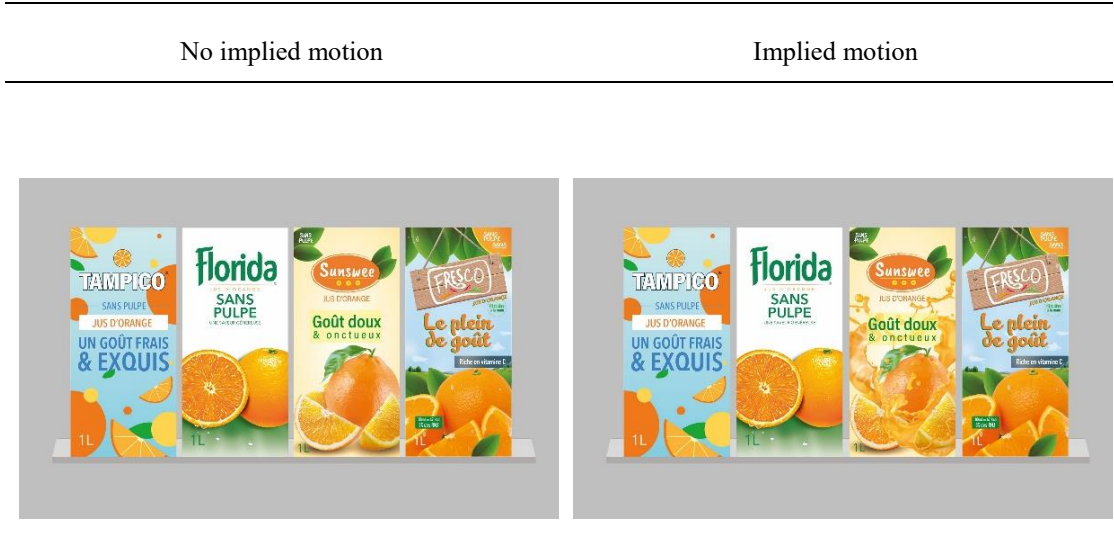
*Declarative  
measures*



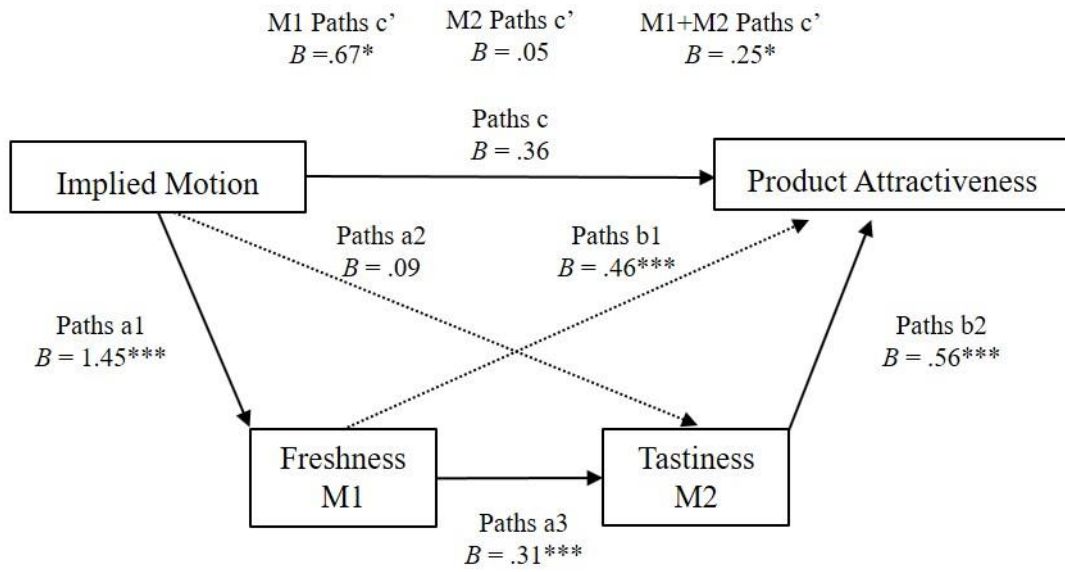
**Figure 2. Target stimuli used in the experiments**



**Figure 3. Mini-shelves for the two experimental conditions (Experiment 1)**



**Figure 4. Serial mediation on consumer responses (Experiment 2)**



\*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$

**Table 1.** Explaining attention: independent t-tests (Experiment 1)

	No implied motion condition N=31	Implied motion condition N=32			
	Mean (SD)	Mean (SD)	t	<i>ddl</i>	<i>p-value</i>
Fixation count (FC)	1.61 (1.83)	2.71 (2.15)	-2.18	61	<b>.033</b>
Fixation time (FT) ms	295 (356)	537 (505)	-2.20	55	<b>.032</b>
Dwell time (DT) ms	302 (371)	537 (536)	-2.02	55	<b>.047</b>
First fixation duration (FFD) ms	103 (101)	157 (108)	-2.06	61	<b>.044</b>

**Table 2.** Explaining product choice: logistic regression analyses (Experiment 1)

<b>Explanatory variables</b>	Not taking attention into account			Taking attention into account		
	b	Wald	<i>p</i>	b	Wald	<i>p</i>
Constant	-2.53	9.65	.002	-3.72	12.67	.000
Implied motion	1.17	1.86	.172	.56	.36	.548
Attention to product image				.00	7.27	<b>.007</b>
Position	-.29	.13	.715	-.16	.03	.849
	Model $\chi^2$ (2) = 2.37, <i>p</i> = .305			Model $\chi^2$ (3) = 11.39, <i>p</i> = .010		



**Table 3.** Explaining evaluations: independent t-tests (Experiment 2)

	No implied motion condition N=63	Implied motion condition N=69	t	<i>ddl</i>	<i>p-value</i>
	Mean (SD)	Mean (SD)			
Freshness	4.57 (2.33)	6.02 (1.94)	-3.88	121.02	<b>.000</b>
Tastiness	5.25 (1.82)	5.81 (1.56)	-1.89	130	.061
Product attractiveness	3.52 (2.13)	4.86 (2.43)	-3.35	130	<b>.001</b>

**Table 4.** Serial mediation effects of freshness and tastiness on product attractiveness  
(Experiment 2)

Outcome: mediators	Freshness (M1)			Tastiness (M2)		
	<i>B</i>	SE	t	<i>B</i>	SE	t
Constant	4.57***	.26	16.98	3.81***	.35	10.81
Implied motion	1.45***	.37	3.91	.09	.28	.34
Freshness				.32***	.06	4.93
Total <i>R</i> <sup>2</sup>	.10***			.18***		
Outcome: dependent variables	Product attractiveness					
	<i>B</i>	SE	t			
Constant	-1.52**	.51	-2.96			
Implied motion	.36	.30	1.18			
Freshness	.46***	.07	6.24			
Tastiness	.56***	.09	6.01			
Total <i>R</i> <sup>2</sup>	.53***					
Indirect effects	<i>B</i>	SE	LLCI	ULCI		
Total	.9842	.2991	.4253	1.6066		
M1	.6719	.2085	.3444	1.1741		
M2	.0547	.1828	-.3165	.4141		
M1+M2	.2576	.1313	.0760	.5912		

\*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$