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Light vs dark: How colour lightness affects the perception of product appropriateness for children and adults – a Polish perspective

Jasny czy ciemny? Jak jasność koloru wpływa na postrzeganie produktów jako odpowiednich dla dzieci i dorosłych – polska perspektywa

Abstract

The article explores the impact of colour lightness on the perception of product adequacy for consumers in two demographic categories (children versus adults). A pretest preceding the main study identified three demographically neutral objects to be coloured in two lightness variants: light and dark. Subsequently, a series of three studies involving a total of 474 adult participants focused on evaluating a product presented in two colour versions: light and dark, deemed appropriate for children and adults, respectively. The study revealed that light shades of the same colours are considered appropriate for children, while dark shades are perceived as suitable for adults. Thus, the research emphasizes the role of colour lightness in shaping the perception of a product among adult consumers in Poland.

Keywords

consumer behaviour, colour in marketing, colour appropriateness to consumers, colour lightness, colour darkness

Streszczenie

Artykuł opisuje wpływ jasności koloru na percepcję adekwatności produktu do preferencji konsumentów w dwóch kategoriach demograficznych (dzieci kontra dorośli). Pretest poprzedzający badanie główne wyłonił trzy neutralne demograficznie przedmioty, które przedstawiono w dwóch wariantach tego samego koloru: jasnym i ciemnym. Następnie seria trzech badań z łącznym udziałem 474 dorosłych uczestników polegała na ocenie produktu zaprezentowanego w dwóch wariantach koloru: jasnym oraz ciemnym jako dopasowanego odpowiednio do preferencji dzieci i dorosłych. Badanie wykazało, że odcienie jasne tych samych kolorów uważane są za odpowiednie dla dzieci, a odcienie ciemne – dla dorosłych. Tym samym badanie podkreśla rolę jasności koloru w kształtowaniu percepcji produktu wśród dorosłych konsumentów z Polski.

Słowa kluczowe

zachowania konsumenckie, kolor w marketingu, adekwatność koloru do konsumentów, jasność koloru, ciemność koloru

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Introduction

Colour serves as more than an ordinary visual element; as it carries meaning (Kato, 2022), holds aesthetic significance (Elliot & Maier, 2014), influences people's emotions (Rapuano et al., 2022), and stimulates purchase intentions (Tantanatewin & Inkarojrit, 2018; Marozzo et al.,

2020). Moreover, colour plays a significant role in shaping brand identity (Phillips et al., 2014), influencing brand favourability and familiarity (Labrecque & Milne, 2012a), driving brand distinctiveness (Labrecque & Milne, 2012b), evoking authenticity (Wang et al., 2022), fostering recognition (Abril et al., 2009), and adding layers of meanings (Garber et al., 2000). The

incorporation of colours into brand identity also ensures a consistent visual representation across various brand touchpoints (Ward et al., 2020), enhancing brand recall (Huang et al., 2008), affecting brand associations and loyalty (Jin et al., 2019), and therefore generating a substantial impact on consumer behaviour of both adults and children.

The previous research has extensively explored how colour preferences vary across different age (Taylor et al., 2013), including infants (Skelton et al., 2022), children (Franklin et al., 2008), adolescents (Jiang et al., 2020), adults (Nascimento et al., 2021; Jeon et al., 2020) and the elderly (Torres et al., 2020). However less attention has been given to the role of colour lightness in these preferences. Although recent research reports that scarcity of childhood resources can lead to preferences for bright stimuli (Wang et al., 2022), there is insufficient investigation about how the level of colour lightness impacts the perception of product appropriateness for different age groups.

As the number of available purchase choices continues to expand, marketers are compelled to ensure effective communication tailored for adults and children. Considering that the number of consumer goods previously reserved primarily for adults (such as mobile phones, tablets, scooters) is now frequently used also by children, incorporating age-specific design elements could be of significant value.

This research is meant to fill this gap by investigating the influence of colour lightness (light vs. dark) on the appropriateness of previously neutral products for children vs. adults according to adult respondents. The following sections will outline the flow of this article: Introduction of literature on colour, product design and theoretical framework with hypotheses, methodology and findings.

Age and colour preferences

The literature review indicates that the method of examining colour preferences often varies depending on the age of the respondents. Colour preferences in adults are often measured through ratings or forced choices between pairs of colour alternatives, while preferences in infants are evaluated using a preferential-looking paradigm (Taylor et al., 2013). Newborns demonstrate a spontaneous tendency by looking longer at chromatic colours compared to achromatic grey stimuli (Franklin et al., 2010), and this tendency changes into a stable preference by the age of

3 months (Adams, 1987). A study conducted on 4-month-old infants indicated that these participants looked longest at 'red' and 'blue' colours, while least at 'blue-green,' 'green,' and 'green-yellow' ones (Bornstein, 1975). Similarly, the results of Zemach et al. (2007) studies suggest that 12-week-old infants looked longest at 'blue,' then 'purple.' 'Yellow' and 'green' gather their least attention. 'Red' colour – unlike in the study of Bornstein (1975) – received a moderate preference. The colour preference is reported to change with age (Taylor et al., 2013). During infancy, children do not exhibit significant gender-based colour preference (Jadva et al., 2010), which changes by the age of 2 years old (Zosuls et al., 2009). Boys tend to switch preference towards blue, green, red, black, and orange. Girls, instead, increasingly favour pink, red (Cunningham & Macrae, 2011), purple (Jonauskaitė et al., 2019), and women's (vs. men's) preference towards pink colour persists in adulthood (Bonnardel et al., 2018). Boys from 5 years old intentionally refrain from choosing objects of pink colour to avoid the stereotype of feminization (Novelle, 2010), and this attitude remains until their adulthood (Jonauskaitė et al., 2019). As children grow up, girls favour lighter colours and dislike dark ones, while boys tend to prefer the latter (Boyatzis & Varghese, 1994). Moreover, children's preference towards colours with high purity is decreasing, while the tendency to select hues consistently becomes more significant as they grow older (Child et al., 1968).

Eysenck (1941) suggested the existence of regular patterns in colour preference in a particular order: blue, red, green, purple, orange, and yellow. More recent studies have supported that idea, demonstrating that some colours are more likely to be preferred than others (Taylor et al., 2013), such as blue over yellow (Palmer & Schloss, 2010). However, scholars recognized variations in colour preferences in different cultures (Ou et al., 2012).

One explanation supporting the tendency to prefer certain colours over others is The Ecological Valence Theory (EVT: Palmer & Schloss, 2010). It states that people tend to like or dislike colours based on how much they like or dislike things typically associated with those colours. A dark greenish-yellow colour, which people strongly disliked, was reported to be linked to dirty water, bile, and rotten food, which are also strongly disliked. On the other hand, the colour-saturated blue, which people had a strong liking for, was connected to things like a clear sky and clean water, which are also strongly liked (Palmer & Schloss, 2010).

Colour in marketing activities targeting children and product design

Colour plays a crucial role in marketing, particularly in communicating with young consumers (Hunjet & Vuk, 2017; Auster & Mansbach, 2012). Children, compensating for cognitive limitations, heavily rely on visual processing, preferring visual stimuli over verbal ones (Dammler & Middlemann, 2002). This preference enables them to easily assess perceptual qualities, fulfilling emotional needs that stimulate purchase desire (Haiying & Gani, 2022).

Young consumers prefer vibrant, lightly coloured packaging over plain or monochromatic options (Angka et al., 2020), especially for items like biscuits, drinks, and cereals (Gollety & Guichard, 2011; Ogba & Johnson, 2010). The colour of packaging also influences taste perceptions; for instance, red packaging is reported to be associated with strong flavours, green with sour and spicy, and pink with sweetness (Gollety & Guichard, 2011). Additionally, children below 10 years prefer coloured plates over monochromatic options (Brunk & Moller, 2019).

Auster & Mansbach (2012) highlight the role of colours in identifying and differentiating nature in marketing activities targeting children, emphasizing careful colour selection in the product development process by marketers on platforms like Nickelodeon (Kahlenberg & Hein, 2010) and toy marketers (Clark, 2007).

Colour is recognized as a key component in both product and package design for children (Jiang et al., 2020), shaping perceptions of price and quality (Kerfoot et al., 2003), influencing sales (Chitturi et al., 2019), and serving as a cost-effective means of product modification (Aslam, 2006). The importance of colour is additionally manifested in legal frameworks like the Lanham Act, safeguarding the use of product colours as registered trademarks in the United States (Madden et al., 2000). Even young children take colour into account when selecting products (Halim et al., 2014).

Colour dimensions

Colour is a multidimensional structure, composed of hue, lightness, and saturation (Gorn et al., 1997), as described by the HSL (Hue, Saturation, Lightness) colour system. Hue, the fundamental attribute, represents the dominant colour perceived by an observer and is typically

defined as colours as red, yellow, and blue (Plataniotis & Venetsanopoulos, 2000). It is often represented on a circular colour wheel, as illustrated by Dufossé and Galaup (2021). Saturation refers to the intensity or purity, or amount of white light combined with the hue (Plataniotis & Venetsanopoulos, 2000), with higher saturation values signifying more vibrant and vivid colours, while lower values lead to pastel or muted tones (Cardani, 2001). Colour lightness, the third dimension, determines the perceived lightness or darkness of a colour, ranging from bright to dark.

While the academic literature extensively covers colour attributes, with a focus on hue (e.g., Eysenck, 1941; Wexner, 1954; Bellizzi et al., 1983; Bellizzi & Hite, 1992) and saturation (e.g., Solomons, 1896; Egusa, 1983; Hagtvedt & Brasel, 2017), relatively few studies were dedicated particularly to colour lightness. It is recent research that has revealed that dark objects are perceived as heavier and more durable, while brighter ones are considered lighter and more user-friendly (Walker et al., 2010; Hagtvedt, 2019). Additionally, Hemphill (1996) demonstrated that bright colours elicit predominantly positive emotions, in contrast to the negative emotions linked to dark colours. The review of prior research on colour lightness are presented in Table 1.

Hypotheses

Light colours are often linked to childhood and youthfulness (Blumberg & Devlin, 2006). They attract young consumers and are commonly employed in products aimed at children to stimulate their interest and emphasize the playful functionality of toys (Light et al., 2004). However, to date, there is a lack of research exploring whether light colours can enhance the appeal of previously neutral products to children. This research aims to bridge this gap by examining the influence of light colours on the perceived suitability of products for children. Ecological Valence (EVT, Palmer & Schloss, 2010), implies that colours are positively associated with particular objects based on past experiences and the positive effects derived from those objects (Bortolotti et al., 2023). Light colours can evoke positive feelings because they are often linked with enjoyable and pleasant experiences. A range of lightly coloured stimuli that children encounter in their daily life, such as red strawberries, green balloons and blue skies are usually associated with pleasure and comfort. Such connection implies

Table 1. Summary review of major colour lightness research in marketing field

Authors	Journal	Area	Major findings
Hagtvedt (2019)	Psychology & Marketing	Colour lightness	Darker (vs. lighter) products are perceived as durable. Products lighter in colour are seen as user-friendly
Walker et al. (2010)	Experimental Psychology	Colour lightness	Darker objects were judged to be heavier than colour-lighter objects
Chung & Saini (2022)	Psychology & Marketing	Colour lightness	Consumers perceive a darker-coloured (vs. lighter-coloured) product as higher hierarchical (HHP)
He & Lv (2022)	Colour Research & Application	Colour lightness & colour saturation	Both the colour saturation and colour lightness are found to be higher (vs lower) for soft drinks (vs. spirits)
Gorn et al. (1997)	Management Science	Colour lightness & colour saturation	High lightness induces greater liking for the brand; higher saturation is associated with higher excitement
Madzharov et al. (2016)	Journal of the Association for Consumer Research	Colour lightness	The colour lightness (vs. darkness) of hedonistic food leads to higher attraction to it and its greater consumption
Kato (2022)	International Journal of Engineering Business Management	Colour lightness	The light reflection brightness of SUVs positively affected consumers' purchase intentions
Hsieh et al. (2018)	Journal of Interactive Marketing	Colour lightness, hue: blue vs. red	Low lightness heightens consumers' price-quality and price-sacrifice associations simultaneously; high lightness increases their price-sacrifice associations, but not their price-quality associations
Hemphill (1996)	The Journal of Genetic Psychology	Colour lightness	Light colours reveal mainly positive emotional associations, while dark colours exposed mainly negative emotional associations

Source: own work.

that previously neutral products might be perceived more favourably when they are presented in light colours. Guided by Bottomley & Doyle (2006) and Schiller's (1935) research on colour appropriateness we present hypotheses:

H1: Products displayed in light (vs. dark) colour are appropriate for children.

In contrast, dark colours such as black, associated with elegance and sophistication (Mofarah et al., 2013), power and formality (Demir, 2020), are disliked by children (Boyatzis & Varghese, 1994) and can resonate more with adult audiences. According to EVT, darker colours can evoke associations with "negative concepts" (Tham et al., 2019, s. 50). and therefore create atmosphere of seriousness (Gupta, 2021). Such associations explains appropriateness of products in dark colours for adult consumers. This leads to the hypothesis:

H2: Products displayed in dark (vs. light) colour are appropriate for adults.

Products for children often employ various strategies, including featuring cartoon characters (Roberto et al., 2010), celebrity endorsements (Zhou et al., 2019), and well-known brand logos (Robinson, et al., 2007), to create a playful and fun-oriented atmosphere (Giménez et al., 2017) that aligns with children's developmental need for play. The playfulness of such visuals not only attracts children (Abrams et al., 2015) but also impacts purchase desire (Saraf, 2013). Moreover, childhood, often synonymous with play, is recognized as natural and essential activity for children (Isenberg & Quisenberry, 1988). Researchers have associated play with positive emotions such as excitement, creativity, and joy (Sufa, 2016), which are frequently linked to the use of light colours (Boyatzis & Varghese, 1994). This aligns with EVT, suggesting that light colours can evoke positive, playful associations, which make them particularly suitable for products tailored for children. Recognizing the

positive association of playfulness with light colours, we extend this exploration to predict:

H3: Products displayed in light (vs. dark) colour are associated with children's play.

Pretest

The primary objective of the pretest was to determine three products that are perceived as neutral and, thus, deemed suitable as graphic stimuli for our main research study. A key criterion for selecting these neutral products was their ability to be associated with both children and adults. Ideally, these products should elicit no specific age-related associations from the respondents, making them equally appropriate for any demographic.

Method

Out of eighteen products selected for the pretest, fourteen were predicted to be validated as neutral, and four were expected to be seen as associated with either adults or children. The inclusion of products specifically tailored for adults and children in the test design served three main purposes: first, to control for age-biased perceptions and assess respondents' ability to distinguish neutral items; second, to establish discriminant validity by comparing responses to age-specific products with those of truly neutral ones; and third, to ensure a diverse representation of the sample, yielding more robust conclusions about neutral product perception.

The graphic representation of all listed products was deliberately limited to white, grey, and black colours, known for their reported neutrality (Kaya & Epps, 2004). The intentional exclusion of products presented in various chromatic colours aimed to avoid potential age-specific associations linked to such hues. Chromatic colours can be linked to particular age groups (Rutkowski, 2023), and the research aim was to ensure a truly neutral perception of products selected for graphic manipulation in the main studies. Additionally, to eliminate potential confounding factors, the graphics of items used as stimuli were the same size, background, and didn't contain any labels, logos, or brand names.

A total of 66 opinions from 32 women (48.48%) and 34 men (51.52%), aged between 18 and 75 years ($M_{age} = 42.62$; $SD = 17.42$), were included in the results analysis. Responses from panellists who reported colour recognition issues or marked incorrect answers in the attention check question were excluded from consideration.

The data were collected in Summer 2023, on the Polish online research platform. An analysis of individual user ID numbers assigned to each respondent confirmed that they participated in the study only once, meant to ensure the integrity and validity of the data collected.

Eighteen graphics of products were presented to participants with instructions in Polish to answer the question, "Who uses the product in the photo?" on a 5-point Likert scale, where 1 – used only by children; 5 – used only by adults. The lower the average value of the results, the more the colour was perceived as suitable for children, and the higher the average value, the more the colour was perceived as suitable for adults. Validated products were placed on a white background – similarly to other research (e.g., Wilson & Till, 2011, p. 913) – to minimize confounding factors, provide a consistent setting for product exposure, and direct participants' attention to product attributes.

The collected data were analysed using a one-sample *t*-test to compare adequacy scores for children versus adults of all tested products. The middle of the scale used – which in this particular case was "3" – was taken as the sample mean. The statistical analysis was performed using Jamovi version 2.3.21, with a significance level set at $\alpha = 0.05$.

Results

Examination of the collected data yielded statistical significance for eleven out of eighteen products. Nine items, namely the drill, ski boots, travel case, cycling gloves, swimming fins, handgun, laptop, mobile phone, and laptop bag, were assessed by respondents as suitable for adult consumers. Conversely, the remote-controlled tank and wooden toy were identified as appropriate for children. Remarkably, all four products included in the pretest initially categorized for both adults and children were indeed perceived by respondents in accordance with our predictions.

The mean scores for the remaining seven items, comprising the hoodie blouse, water bottle, swimming goggles, socks, sports shorts, sneakers, and T-shirt, exhibited results proximal to the midpoint of the utilized 1–5 scale, with a *p*-value exceeding 0.05. These outcomes suggest a lack of statistical significance. Consequently, these products were neither conclusively associated with children nor adults, warranting their categorization as suitable for both age groups and aligning with the criteria for inclusion in the main studies.

Water bottle ($M = 3.00$; $SD = 0.66$; $p = 1$), hoodie blouse ($M = 3.08$; $SD = 0.59$; $p = 0.301$), and swimming goggles ($M = 2.98$; $SD = 0.54$; $p = 0.821$) listed in Table 2 were then selected for

Table 2. One sample *t*-test results of products selected for main studies

Product no.	Product suitability for children vs. adults						Product classification
	Product picture	Product name	<i>M</i>	<i>SD</i>	<i>t</i>	<i>p</i>	
1		Hoodie blouse	3.08	0.59	1.043	0.301	Product used by both children and adults
2		Water bottle	3.00	0.66	0.000	1.000	Product used by both children and adults
3		Swimming goggles	2.98	0.54	-0.228	0.821	Product used by both children and adults

Source: own work.

studies 1A, 1B, and 1C, respectively. This selection was made based on the fact that, among all the products that met the selected criteria, they represented different product categories. Their inclusion in main studies design was intended to provide higher robustness to potential findings.

Discussion

The pretest successfully identified neutral graphic stimuli, distinguishing products with age-specific associations from those suitable for both adults and children. This distinction allowed for a careful selection of products to be used in the subsequent studies, aiming to explore the impact of colour lightness manipulation on age-specific product categorization.

Main studies

The present research comprises three studies, each employing graphic manipulations and conducted in the Polish language, with the primary objective of exploring the potential impact of colour lightness (light vs. dark) on product suitability assessments for different age groups (children vs. adults). A number of previous studies on colour preferences were conducted using colour patches (Ou et al., 2004; Ou et al., 2018; Xin et al., 2004); however, as noted by Norman and Scott (1952), this approach does not

necessarily measure how people respond to coloured products but rather their evaluation of colour samples. It remains uncertain whether the reactions to these colour samples can be applied to understand responses to product colours. Due to this uncertainty, a product pretest was conducted – when it was possible – using items with neutral colours. The main studies were then designed, with each product showcasing one of three colours derived from the RGB colours, including red, green, and blue, selected deliberately, due to their versatile nature. All mentioned colours were chosen because they are acknowledged to be primary RGB colours (Li, 2011, p. 277) because the combination of their various proportions has the capacity to create a wide range of secondary and tertiary colours (Meruga et al., 2014, p. 2224), and because red, blue, and green are often described as the most popular colours (Ward, 1995, as cited in Madden et al., 2000). The confirmation of the tested effect on selected hues can, therefore, suggest its robustness across a wide array of colours. Furthermore, the examination of colour brightness effects across three distinct product categories was intended to determine the consistency and applicability of the findings in various consumption contexts.

In Study 1A, we examined the perceptions of Polish respondents toward identical water bottles presented in two red colour variants (light vs. dark). Study 1B, on the other hand, investigated the assessments of two identical hoodie blouses, differing only in the lightness level of the green colour (light vs. dark). Lastly, Study 1C focused on

product assessments for swimming goggles, presented in two blue colour variants (light vs. dark). The exact colour variations incorporated for all three studies were adopted from Hagtvedt (2019, p. 866) together with the research method of the study. The exact colour specifications used in studies were as follows:

- **Red colour water bottles (Study 1A):** light-coloured bottle: (HSL: 0, 100%, 36%; RGB: 184, 0, 0); dark-coloured bottle: (HSL: 0, 100%, 18%; RGB: 92, 0, 0).
- **Green colour hoodie blouses (Study 1B):** light-coloured blouse: (HSL: 60, 18%, 68%; RGB: 187, 187, 158); dark-coloured blouse: (HSL: 60, 18%, 34%; RGB: 102, 102, 71).
- **Blue colour swimming goggles (Study 1C):** light-coloured goggles: (HSL: 200, 100%, 40%; RGB: 0, 136, 204); dark-coloured goggles: (HSL: 200, 100%, 20%; RGB: 0, 68, 102).

The data for all studies were collected from Polish-speaking respondents in a fall 2023 via the Polish online research platform Ankieto, and data analysis was conducted using IBM SPSS software.

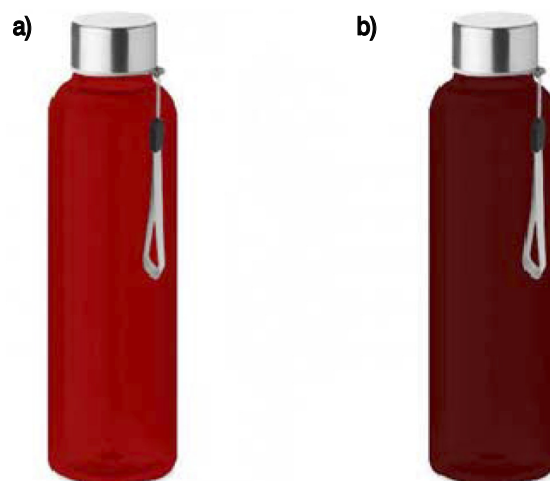
Study 1A

The opinions of one 130 respondents were qualified to be considered in the analysis, including 76 women (58.46%) and men (41.54%), aged 18 to 75 years ($M_{age} = 46.08$; $SD = 16.02$). Responses of participants who reported colour recognition problems and those who did not pass an attention check question included in the questionnaire were excluded from the analysis. All respondents took part in a research only once; it was verified by analysis of individual ID assigned to each participant in the mentioned research platform.

The panellists were asked to view two identical in shape and colour water bottles, comparatively different in the colour lightness level (light-coloured vs. dark-coloured). In order to avoid potential stemming effect, the exposition of graphic stimuli was counterbalanced (Figure 1). Approximately half of respondents (63 participants in group A: 34 female, 29 male, $M_{age} = 47.41$, $SD = 17.04$) were randomly assigned to the condition where the light-coloured product was presented on the left, while its dark equivalent was shown on the right. The other group of respondents (67 participants in group B: 42 female, 25 male, $M_{age} = 44.84$, $SD = 15.02$) viewed the light product on the right, and the dark bottle on the left.

Participants were asked two questions: "Which of the products is more appropriate for the child?" and encouraged to pick one of two presented graphics. The same method was used for the question: "Which of the products do you associate

Figure 1. Stimuli for Study 1A



Red colour water bottle (Study 1A):

- a) Light-colour bottle (HSL: 0, 100%, 36%; RGB: 184, 0, 0);
- b) Dark-colour bottle (HSL: 0, 100%, 18%; RGB: 92, 0, 0)

Source: own work.

more with children's play?". The term 'play' (*zabawa*) has been modified with an addition of adjective 'childhood' (*dziecięca*). This procedure was meant to rule out the risk of interpretation of the play as, for instance, a social gathering. Therefore, this adjustment aimed to focus the research item on a potential associations with childhood, which is the central focus of the investigation.

The sequence of responses to all inquiries was counterbalanced systematically, such that in instances where a light-coloured product occupied the left position, the initial response identified the left-side product as more appropriate for a child. Conversely, in scenario where a dark product was positioned on the left, the primary response denoted that the product unsuitable for children was located on the left. Notably, both questions and responses deliberately refrained from explicitly mentioning the distinction in product attributes related to colour brightness levels. This precaution was taken to avoid priming respondents' perceptions or influencing their preferences through explicit information about colour manipulation. This methodological approach was designed to elicit unbiased and spontaneous responses, facilitating a more accurate exploration of participants' genuine preferences for the presented products.

Results and discussion. The χ^2 analysis revealed that 103 (vs. 27) participants chosen the light-coloured red water bottle ($\chi^2(1) = 44.43$, $p < 0.001$) as suitable for children, which confirms H1. A similar analysis indicated that 111 (vs. 19)

respondents recognized the light-coloured red bottle as associated with children's play ($\chi^2(1) = 65.11$, $p < 0.001$), which supports H3.

In Study 1A, saturation and hue were kept constant, while colour value was the object of manipulation. The results, analysed using χ^2 tests, revealed a significant preference for the bright red water bottle as more suitable for children, supporting hypothesis H1. A substantial majority of participants (103 vs. 27) chose the light-coloured red bottle, indicating an association between colour brightness and perceived child-appropriateness. Moreover, a similar analysis demonstrated that a significant number of respondents (111 vs. 19) recognized the light-coloured red bottle as linked to children's play, supporting hypothesis H3.

These findings suggest that colour lightness, as manipulated in the study, has a distinguishable impact on participants' perceptions of product appropriateness for children and associations with children's play.

Study 1B

The method of conducting Study 1B was the same as Study 1A, besides the fact that a green hoodie blouse was used as a stimulus, and the participants were asked, "Which of the products is more

appropriate for adults than for children?" and "Which of the products do you associate more with children's play?". Just like in Study 1A, both the order of presented pictures and the order of responses for all questions were counterbalanced (Figure 2).

The total number of 121 respondents, including 72 females (59.50%) and 49 males (40.50%), aged 18 to 75 ($M_{age} = 46.58$; $SD = 15.64$), passed the attention check question and didn't declare colour perception issues, making their opinions qualified for further analysis. Just like in Study 1A, the respondents in Study 1B were divided into two groups to avoid the stemming effect. Group A contained 66 participants ($M_{age} = 46.20$; $SD = 16.59$), including 37 females (56.06%) and 29 males (43.94%), while Group B: 55 respondents ($M_{age} = 47.04$; $SD = 14.56$) consisted of 35 females (63.64%) and 20 males (36.36%).

Results and Discussion. The χ^2 analysis revealed that 81 (vs. 40) participants selected the dark green hoodie blouse ($\chi^2(1) = 13.89$, $p < 0.001$) as suitable for adults, supporting H2. Additionally, 93 (vs. 28) respondents associated the light-coloured version of a blouse with children's play ($\chi^2(1) = 34.92$, $p < 0.001$), confirming H3 and the results from Study 1A.

The results of Study 1B replicate and extend those of Study 1A, providing consistent evidence that colour brightness significantly influences

Figure 2. Stimuli for Study 1B



Green colour hoodie blouses (Study 1B):

a) Light-colour blouse (HSL: 60, 18%, 68%; RGB: 187, 187, 158);

b) Dark-colour blouse (HSL: 60, 18%, 34%; RGB: 102, 102, 71)

Source: own work.

perceptions of product suitability for adults and associations with children's play. Additionally, since Study 1B specifically investigated a product category within the fashion industry, the findings may suggest the generalizability of these results to fashion products.

Study 1C

The method employed for Study 1C closely resembled that of Studies 1A and 1B, with the exception that blue swimming goggles were utilized as stimuli, and participants were presented with all three queries utilized in previous studies (Figure 3).

A total of 223 respondents, comprising 139 fe-males (62.33%) and 84 males (37.67%), ranging in age from 18 to 79 ($M_{age} = 42.66$; $SD = 16.76$), effectively passed the attention check question and indicated an absence of colour perception issues. These individuals were considered suitable for inclusion in further analyses. As was done in previous studies, the participant pool for Study 1C was distributed randomly into two groups to mitigate any potential stemming effects. Group A encompassed 110 participants ($M_{age} = 42.33$; $SD = 16.68$), of which 75 were female (68.18%) and 35 were male (31.82%). Meanwhile, Group B consisted of 113 respondents ($M_{age} = 42.98$; $SD = 16.90$), with 64 being female (56.64%) and 49 being male (43.36%).

Results and Discussion. The application of χ^2 analysis unveiled that a substantial number of participants, 162 (vs. 61), opted for the light-coloured blue swimming goggles ($\chi^2(1) = 45.74$, $p < 0.001$ as the choice appropriate for children. Additionally, 168 (vs. 55) respondents chosen dark blue swimming goggles ($\chi^2(1) = 57.26$, $p < 0.001$) as suitable for adults. Listed results confirm findings from previous studies and support both H1 and H2.

The χ^2 analysis of the third question revealed that 194 (vs. 29) respondents ($\chi^2(1) = 122.08$, $p < 0.001$) associated light-coloured blue swimming goggles with children's play, which confirming H3.

General discussion

We conducted three graphic manipulations to examine the potential impact of product colour lightness on its suitability for distinct age groups (children vs. adults) and its associations with children's play. While the conventional belief that children gravitate towards bright colours is well-established, empirical verification on products, previously assessed as neither appropriate for adults nor children, has not been undertaken until now. This research fills this gap, contributing to an understanding of how the colour lightness of a product impacts its appropriateness for children (vs. adults).

Figure 3. Stimuli for Study 1C



Blue colour swimming goggles (Study 1C):
a) Light-colour goggles (HSL: 200, 100%, 40%; RGB: 0, 136, 204);
b) Dark-colour goggles (HSL: 200, 100%, 20%; RGB: 0, 68, 102)

Source: own work.

The pretest phase successfully identified neutral products suitable for graphic stimuli, ensuring the absence of age-specific associations. The main studies involved graphic manipulations of three distinct product categories, each representing a different colour (red, green, blue) and varying in colour lightness (light vs. dark).

Results from Study 1A, focusing on water bottles, indicated a significant preference for the light-coloured red variant, perceived as more suitable for children, thereby confirming H1. Additionally, participants associated the light-coloured red bottle with children's play, aligning with H3. In Study 1B, involving green hoodie blouses, there was a significant preference for the dark green variant as suitable for adults, validating H2. Furthermore, the light-coloured green blouse was associated with children's play, supporting H3. Study 1C, centred on blue swimming goggles, demonstrated a preference for the light-coloured blue variant as suitable for children and the dark blue variant as suitable for adults, confirming H1 and H2. Participants also associated the light-coloured blue goggles with children's play, providing additional support for H3.

The inclusion of previously selected products in the main studies, evaluated by respondents as demographically neutral, coupled with the significant shift in perception evaluation after colouring these items, suggests that colour lightness indeed impacts the perception of product appropriateness for children and adults.

Moreover, the research's strengths lie in its comprehensive exploration across three distinct product categories (represented by water bottle, hoodie blouse, and swimming goggles) and all three primary RGB colours (red, green, blue). This broad scope enhances the generalizability of our findings to various product categories and a wide spectrum of colours, contributing to the robustness of our conclusions. The controlled experimental design guided by Hagtvedt (2019) research, with counterbalanced conditions and attention checks, contributed to the methodological rigor of the study, strengthening the validity and reliability of our results.

Overall, this research advances our understanding of how colour lightness influences consumer perceptions, particularly in the context of product appropriateness for different age groups. The findings have practical implications for marketers and designers, emphasizing the importance of considering colour lightness in product development to align with target demographics effectively. Manufacturers of products for children can prioritize light colours in their designs to enhance appeal and suitability for their target age group. Marketers can use colour-based segmentation strategies, incorporating light

colours for products intended for children and dark colours for items aimed at adults. Retailers can optimize store layouts by organizing product displays according to colour lightness to match the desired age group, potentially improving sales conversion rates. Additionally, brands can utilize the research results to create visual identities aligned with their target demographic. The results of this study can therefore guide strategic decisions across various stages of product development and marketing activities, potentially providing substantial benefits in return on investment.

Limitations and further research

While the studies (1A, 1B, and 1C) contributed substantial insights into the influence of colour lightness on consumer perceptions across various product categories, it is crucial to acknowledge certain limitations. Firstly, the use of graphic stimuli, such as water bottles, a hoodie blouse, and swimming goggles, might not fully capture the complexity of real-world consumer decision-making processes. Furthermore, as the studies were conducted using respondents' personal devices, it is uncertain whether the angle of viewing stimuli, the exact shade of colour, and the distance from the displayed graphic were consistent across all participants. Exploring the cultural nuances in colour perceptions and expanding the scope beyond Western contexts could provide a more comprehensive understanding of the impact of colour brightness on consumer preferences.

Importantly, the use of the terms "appropriate for children" and "appropriate for adults" in the hypotheses might unintentionally suggest, that the research involved direct assessments from children, which was not the case. The study was conducted with adult respondents who evaluated the "appropriateness of colours for children and adults."

Existing literature on colour preferences across different age groups suggests, that the colour lightness plays a role in product perception. However, further research is needed to examine how colour preference for children's products are perceived by children, adults, and adults purchasing products for children. Such an approach in future studies, could bridge this gap and allow for a more profound exploration of the relationship between colour lightness and product suitability. Despite these limitations, the current studies lay a robust foundation for future research endeavours in understanding the complex relationship between colour, consumer perceptions, and product preferences.

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Dr Janusz Rutkowski

Stopień doktora w dziedzinie zarządzania uzyskał na Uniwersytecie Jinan w Kantonie w Chinach. Jest badaczem i ekspertem marketingu, specjalizującym się w pozycjonowaniu marek, różnicowaniu produktów i tworzeniu strategii marketingowych różnych kategorii produktów, ze szczególnym uwzględnieniem sektora FMCG. Praktyczne doświadczenie zdobywał, współpracując z liderami rynków w Indiach i Chinach w zakresie strategii oraz marketingu międzynarodowego, co współgra z jego zainteresowaniami badawczymi, związanymi z marketingiem wizualnym/sensorycznym, projektowaniem produktów, zachowaniami konsumenckimi i strategią marki.

Zhou Xiaoe

Wykładowczyni na Uniwersytecie Technologicznym w Guangzhou w Chinach. Specjalizuje się w badaniach komercyjnych wśród chińskich konsumentów, skupiając się na identyfikowaniu potrzeb klientów w zakresie towarów szybko zbywalnych najwyższej jakości w różnych kategoriach, takich jak pielęgnacja ciała, jedzenie dla zwierząt, mięso i mleko. Zajmuje się pozycjonowaniem marketingowym oraz opracowuje strategie brandingowe i marketingowe dla międzynarodowych korporacji eksportujących towary do Chin. Czternastoletnie doświadczenie w badaniach i nauczaniu pozwoliło jej napisać podręcznik *Consumer Behavior* (2022) dla studentów specjalizujących się w biznesowym języku angielskim.