TOWARDS ELDERLY FRIENDLY MEDICAL LABELS: THE USE OF CONJOINT TECHNIQUE FROM MARKETING TO NURSING

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Abstract

This study aspired to capture the preferable medicine labels from the lens sixty (60) purposively selected insulin-dependent Filipino seniors from an urban community in the Philippines using Conjoint technique through an innovative Prototype Object Sorting (POS). This made use of the interesting attributes from a wealth of scientific literature in drug marketing, namely: (1) color, (2) font style, (3) font size and (4) language. Results showed that color (37.40) is the most important factor in the seniors' preference of medical labels, followed by font style (32.63) and font size (20.13). Accordingly, the respondents' consider language translation as their least preferred (9.83) factor. It can be deduced from the study results that researchers in both healthcare and marketing shall consider age-related preferences in medical packaging which may further result to increased utilization and better understanding of personal medication practices among patients.

Keywords: Card-based, Conjoint Analysis, Elderly, Medical Labels, Medicine, Prototype Object,

BACKGROUND

The global community is experiencing a demographic change in the coming years. The growth in the number of the older people is so dramatic that is has been described as a silent revolution. The increasing numbers of the elderly and the healthcare services that these demand have to be addressed. An active involvement of the aging population towards their health is favorable. However, various sensory changes transpire with aging that makes it harder for them to actively involve themselves. One definite proof is the changing eye structures that occur as one ages which makes focusing the eyes on something close difficult.

Writing information that patients can read and understand has been an ongoing challenge for nurses, educators and researchers in health care (Eyles, Skelly, Lou Schmuck, 2003). It has been the goal of the medical field to increase health literacy with the belief that it is directly related to health compliance. However, labels and health information presented in an inappropriate reading level may result to patients, particularly the elderly, disregarding the health information the labels offer. It was stated by Kalsher, Wogalter, Racicot in 1996 that people often have difficulty with the labels because the print on the label is too small for them to read.

The influence of medical labels among the elderly has received considerable attention to the researchers. A large body of data concerning the effectiveness of different medicine labels to the elderly client has been reported. In recent years, there have been many papers describing the value of color, font style, font size to the medicine labels but little research about inclusion of language translated in the local dialect. Hence, additional studies of medicine label attributes are justified.

The aim of the present work was to determine the preferable combination of font color, font style, font size, and presence or absence of language translation on medicine labels among insulin dependent diabetes

mellitus clients. In this study, the prototype object sorting method is introduced.

2.0 Review of Related Literature

The initial literature review focused mainly on studies that examined the role of color, font style and font size in forming non-verbal element of a medicine label. We then expanded the review to consider research that targeted other characteristics that are perceived to be important, including language or translation to the local dialect. After analyzing the findings in the literature, four criteria of medical label components are identified: color; font style; font size; and language.

2.1 Color

One of the factors that affect the elderly in choosing the most preferred medicine label is color. Color preference, in particular, is very important in directing many sides of human behavior, since it determines how people pay attention to visual environment (Del Rosario, 2013; Adams; 1987). Technically speaking, the perception of color is simply the reflection of light from an object that is possible only when perceived by an observer (Griffith, 2012). Elliot and Maier (2007) added that color "communicates specific information" but its influence is likely to occur outside of conscious awareness. Visual search is an efficient measure of the effects of different presentation factors on the speed with which humans can process large amounts of complex graphical information (Lindberg & Näsänen, 2003), including color.

Different color combinations can achieve different visual effects and create a more pleasing and stylish product image (Ma, Chen, & Wu, 2007). Several researches have studied the color preferences among various populations. Color perception among females 50 and over has been directed towards the darker shade rather than the lighter counterpart (Kose, 2008). Del Rosario (2013) predicted in his research on color preferences that as a person grows up, his or her affiliation to color shifts from the shorter wavelengths such as red and yellow, to colors with longer wavelengths such as blue and green. However, the former have studied color preferences with preschoolers as their respondents, necessitating the need to conduct further studies that determines the color preference specific to the elderly population. In line with this problem, the researchers have formulated the following inquiry:

Research Question 1: Do elderly prefer the color blue among green, yellow and red?

Accordingly, the researchers argued that:

H_1: Elderly prefer blue over the remaining sampled colors.

2.2 Font Style

Reading speed is reduced by poor print legibility, but little is known about the specific font characteristics that can survive the kinds of image degradation experienced by people with visual impairment (Yager, Aquilante, Plass, 1998).Plass and Yager (1998) reported that, for low-vision subjects, there was no reliable difference in reading speed between Times Roman, a serif font and Arial, a sans serif font, when print was approximately four times single-letter acuity threshold. Plass and Yager (1998) character font is a factor that can affect visual performance. In the study of Cai et al., a recognition test was conducted on the most commonly used Chinese characters in the Ming, Kai, and Li styles, measuring the minimum visible size of each character in each style that was presented on sleek format (Shen, Shieh, Chao, Der-Song, 2009).

Future research might include examining the readability and saliency of warnings on more hazardous products with greater variations in simple font styles (Shen, Shieh, Chao, Der-Song, 2009). Ivry and Robertson (1998) the similarities and contrasts between words and style raise interesting questions about the nature of the visual representations for both, what they share and how they differ. Differences in these representations would also be illuminating for long-standing debates about purported distinctions in perceptual mechanisms of the two hemispheres (Ivry and Robertson, 1998). While (Doaket al. 1996; Rankin & Stalling 1996) said that selecting an appropriate typeface style and font size made text easier for patients to read. The study was supported by different researches, specifically, the research of Eyles, Skelly and Schmuck (2003)

pointing that the Arial is the most preferred typeface among the respondents. Nevertheless, the former have studied font style with the different age groups as their respondents, requiring the need to conduct further studies to verify the font style fondness specific to the elderly population. Corresponding to this problem, the researchers have formulated the following inquiry:

Research Question 2: Do elderly prefer the font style Arial amid Times New Roman, Tahoma, Perpetua and Mistral?

Consequently, the researchers argued that:

H_2: Elderly prefer Arial over the remaining sampled font styles.

2.3 Font Size

One aspect of warning labels that has not received any attention concerns the size difference between the signal word and the body of the warning. This is surprising because warnings on consumer products often contain signal words that are printed in a larger point size than the remaining text of the warning (Silver and Braun, 1993). Research should focus on all components of readability, including typography, ensuring that patients can read the typeface and font size clearly (Eyles, Skelly and Schmuck, 1998). This size contrast between the signal word and the subsequent text may influence the perceived readability of the warning (Silver and Braun, 1993). Patients, who can easily read their health care instructions, are more likely to comply with the guidelines provided (Eyles, Skelly and Schmuck, 1998). Paterson and Tinker (1940) found little difference in reading speed among 9- to 12-point sizes, interestingly, the elderly chose a small font size than big ones the reason for this is the use of eyeglasses which gives the inducements on their sight to read.

Research Question 3: Do the elderly prefer smaller font size (pt.12) over larger font size (pt.12 and above)?

Therefore, the researchers argued that:

H_3: Elderly participants prefer smaller (pt. 12) font size over larger font size (pt.12 and above)

2.4 Language

Languages serve as one of the major component of medicine labels. It provides the understanding of each detail of the medicine labels. Native language increases the comprehension of each individual in reading a medicine labels, it gives hopes to those who are illiterate to English but literate to their own languages. Reliable and understandable drug information is necessary in helping all Canadians makes informed and better choices about their health (Gedeon, 2010).The ‘‘English Only’’ issue illustrates that the elements of ‘‘a language’’ are diverse and highly contextualized, and, therefore, we propose that his principle of integrationalism is the best way to study the complex, multidimensional nature of language (Sinsheimer, 2005).

Still, very few researches have investigated the matter about language use, particularly on medicine labels. Based on the few and the researchers’ observation, the following research question has been created:

Research Question 4: Do the elderly prefer medicine labels with integrated English and Filipino language over labels with English language only?

H_4: The elderly prefer medicine labels with integrated English and Filipino language.

Considering the relationships involved among the variables presented, the following research simulacrum was devised:

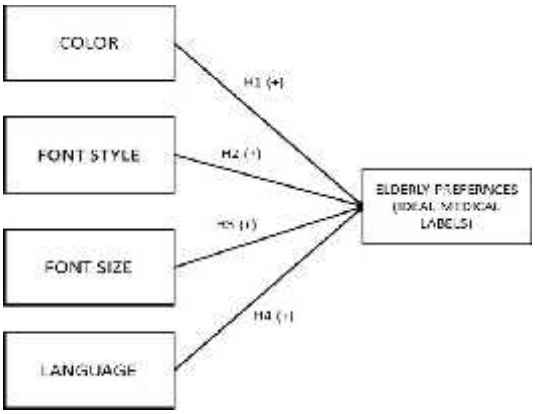

Figure 1: Hypothesized relationship between ideal medical label and several attributes.

3.0 Methods

3.1 Research Design

The researchers focused on quantitative design to examine the preferences of the elders to medical labels. The group determined the preferable medical labels of the elders with the used of conjoint analysis. Conjoint analysis has been widely used to elicit preferences through presentation of an array of attributes or profiles among specific market groups (Noguchi & Ishmi 2000; Park, 2004; Bridges, Hauber, Marshall, Lloyd, Prosser, Regier, Johnson & Mapuskopf, 2011).

Explicitly in this study, the researchers utilized the prototype-based of conjoint analysis.

3.2 Research Locale

The researchers gathered information in an urban area in the Philippines and focused on three barangays. Most of the respondents come from extended type of family, living in a shelter made of light materials, while some of them are living in a concrete house with their spouse only.

3.3 Population and Sampling

Purposive sampling or sometimes referred to as "judgmental" or "selective sampling" is a study wherein researchers consciously selects certain participants, elements, events, or incidents to include in the study (Morse, 2007). The group intended to determine the preferable medicine label of elders, and purposively congregated a total of 60 senior citizens of the barangays in an urban are in the Philippines to undergo prototype card sorting using bottles. The researchers set different criteria in selecting the respondents that suit to the study to gather in-depth information: [1] Gender; [2] 60 years old and above [3] Filipino citizen; [4] Diabetes Mellitus (DM) Patient; [5] Insulin dependent; [6] Living in an urban area; [7] Literate; [8] History of Illness 5 years and above; and [9] Willing to participate .

3.4 Research Ethics

The researchers observed several ethical principles in the conduct of this study: [1] Principle of respect for persons indicates that people should be treated as autonomous agents with the right to self-determination and the freedom to participate or not to participate in research; [2] Principle of justice states that human subjects should be treated fairly in terms of the benefits and the risks of research; [3] Right to Privacy is the freedom people have the determined the time, extent, and general circumstances under which their private information will be shared with or with the held from others. All subject data for the study were de-identified and kept securely and the Institutional Ethics Review Committee of the Institution approved the study.

3.5 Research Instruments

The researchers created a new type of instrument to gather the data, the prototype object sorting using bottles. The group formulated 64 different cards with diverse formats. Using orthogonal array the researchers generate 16 set of cards which was formed by the attributes; color, font style, font size and language and 2 placebo cards. Placebo cards helped the researchers to control the study. The group spawned 18 set of medical labels with different formats.

3.6 Data Collection

The researchers went to the Central Health Department of Region III to ask for the approval to conduct the research to a specific urban area and Provincial Health Office to follow the protocol in gathering information for the research about the medicine labels for the elderly client. On the process of data gathering, ethical clearance was secured. The respondents were given 16 prototype object sorting using bottles plus 2 placebo and they need to sort the medicine labels from rank 1 as there most preferred to the least preferred. Each bottle has different arrangement that includes color, font size, font style and language. After the data was gathered, the results was interpreted and analyzed by the statistician and a critical friend. A critical friend can be defined as a trusted person who asks provocative questions, provides data to be examined through another lens, and offers critiques of a person's work as a friend (Costa and Kellick, 1993).

3.7 Data Analysis

Descriptive statistics was used to characterize demographic characteristics. Sawtooth and SPSS version 21 were utilized for the conjoint analysis.

4.0. Results

4.1. Demographic Profile

As indicated in Table 1, more than half of the respondents are female (62%) in their early senior years (47%), and suffering from DM (82%) and insulin-dependent (73%) for no less than 10 years.

Table 1
Respondents' Demographic Profile (N=60)

Demographic	Value	Percentage
Gender		
Male	23	38
Female	37	62
Age		
60-65	28	47
66-70	22	37
71-75	6	10
76-80	1	2
81-85	2	3
86-90	1	2
Number of years with DM		
10-15 years	49	82
16 years and above	11	18
Number of Years of Insulin Dependency		
10-15 years	44	73
16 years and above	16	27

4.2. Conjoint Scores

Table 2 explicates the conjoint scores obtained for the different attributes and corresponding layers of medication labels for the elderly as specified by attributes, layers, utility estimate, standard error, important values of each attributes. These results indicate that the most important attributes is color (37.40) followed by font style (32.63), font size (20.14) and the least attribute is language (9.83). The table also illuminates the following findings under each attributes as preferences: [1] blue is the most preferred color (10.33) followed by PCC 4 (3.32), PCC 3 (1.48), Red (1.31), SC (-1.33), PCC 2 (-2.55), PCC 1 (-3.34), Yellow (-3.91) and Green (-5.30); [2] Font 12 typeset attained the highest utility estimate (0.73) for size, followed by 18 (0.22), 16 (0.17) and 14 (-1.12); [3] Arial gets the highest score (8.10), followed by Tahoma (3.61), Times New Roman (0.85), Perpetua (-3.91) and the least is Mistral (-8.64); [4] English with local translation is most preferred by the respondents (2.71) over English (-2.71) in terms of language.

Table 2
Conjoint Analysis Results for Physical Attributes of Medication Labels

Attribute	Layers	Utility Estimate	Standard Error	Important Values
Color	SC (Yellow, Red, Green)	-1.33	0.15	37.40
	Yellow	-3.91	0.22	
	Red	1.31	0.25	
	Blue	10.33	0.45	
	Green	-5.30	0.24	
	PCC 1(Blue, Yellow)	-3.34	0.17	
	PCC 2 (Yellow, Red)	-2.55	0.15	
	PCC 3 (Red, Green)	1.48	0.19	
	PCC 4 (Blue, Red)	3.32	0.24	
Font Size	Font 12	0.73	0.19	20.14
	Font 14	-1.12	0.16	
	Font 16	0.17	0.24	
	Font 18	0.22	0.18	
Font Style	Arial	8.10	0.19	32.63
	Times New Roman	0.85	0.24	
	Tahoma	3.61	0.25	
	Perpetua	-3.91	0.24	
	Mistral	-8.64	0.27	
Language	English with local translation	2.71	0.12	9.83
	English	-2.71	0.12	

Note. SC-split complementary; PCC-primary color combination

Contemplating on the variables of the study against the important values that emerged from the data analysis the following figure is presented:

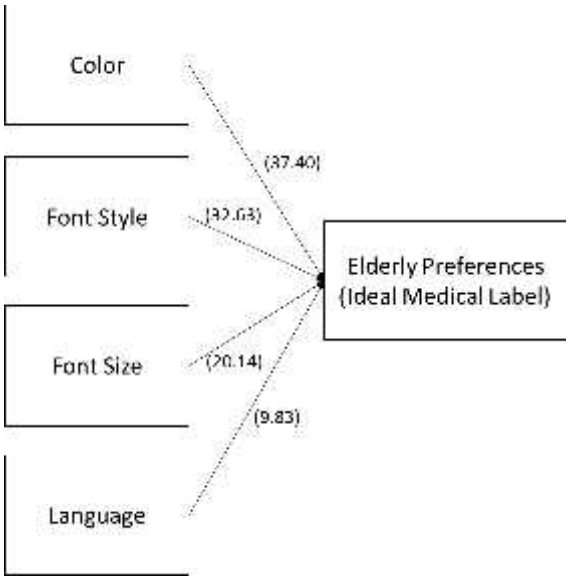

Figure 2: The important values of different variables.

5.0. Discussion

The respondents agreed that the most important component of the medicine label is the color. According to Yun, Han, Hong, & Kim(2003),color correlates highly with consumer impressions of a product. Most of the respondents preferred blue as the major color of the medicine label because Filipinos considered blue as the standard color of living with its coldness and humidity (source). This is similar to the expectation of Del Rosario (2013) wherein as a person grows older, his or her preference shifts towards colors with longer wavelengths, particularly blue which has the longest wavelength among the sampled colors.

Font style is also a consideration in choosing the best medicine label. There are differing results in the literature with respect to the optimal font style for the elderly (Silver and Braun, 1993). It was shown that the elders prefers Arial typeset: sleek font style that seen more understandable and has a structured format unlike exaggerated ones that has amorphous features and cursive writing that makes it more complicated to be understood by the elders. This was further supported by various literatures (e.g.Eustace et al., 1982; Morrell et al., 1990) stressing that the impact of letter compression and vertical letter height on measures of readability among a group of elderly subjects viewing labels for existing pharmaceuticals.

Font size is a factor also for their preference although there are specific recommendations for the minimum font sizes for positive (Smith, 1979). Paterson and Tinker (1940) found little difference in reading speed among 9- to 12-point sizes, interestingly, the elderly chose a small font size than big ones the reason for this is the use of eyeglasses which gives the inducements on their sight to read. Mumford, (1997) finds that a significant number of patients selected a sans serif typeface style in the 12-point font size to read and also, it is best for their use of medicines, primarily the insulin, for easy access and transport which can be pocket size.

Lastly,Language is one of the factors affecting the preferences of the respondents and the elders choose English with Filipino translation, they think that importance of our native language can make them more knowledgeable to the contents of each medicine label unlike those languages with full English Translation because they find it more confusing and their knowledge is not what it used to be fully compensate their understanding on the contents of the medicine label.

6.0 Conclusion

The study purported to understand the preferences of the elderly in terms of medication labels using conjoint analysis utilizing selected attributes, namely: color, font style, font size and language. The results poses that the most imperative attributes is color followed by font style, font size and language. Results highlighted the importance of identifying the preferences of the consumer that may provide useful results in future product and packaging development. It can be deduced from the study results that researchers in both healthcare and marketing shall consider age-related preferences in medical packaging which may further result to increased utilization, better understanding of personal medication practices and improved health care outcomes among patients.

7.0 Recommendation

Future researchers may benefit from and improve the study in various ways. First, a more extended sample is recommended to further explore the preferences representative of the whole elderly population. Second, a

replicate study in other fields, territories, and stage of human development is also essential. The possibility of improvement in medication compliance by modifying medicine labels and packaging may also be explored. This may lead to an inexpensive solution to improve medication adherence among the elderly which may eventualy result to improved health care outcomes. Finally, prototype object sorting, as a new data gathering component of conjoint analysis, may be explored by other scientists to ascertain its validity and reliability.

References

Alonzo, A., & Taft, M. (2002). Sonority Constraints on Onset–Rime Cohesion: Evidence from Native and Bilingual Filipino Readers of English. *Brain and Language*, *81*(1-3), 368–383. doi:10.1006/brln.2001.2531

Ansarri, I., &Datta, A. (2003). An overview of Sterilization methods for packaging materials used in Aseptic Packaging System. *Trans IChemE, 81*, 57–65.

Ares, G., &Deliza, R. (2010). Studying the influence of package shape and colour on consumer expectations of milk desserts using word association and conjoint analysis. Food Quality and Preference, 21(8), 930–937. doi:10.1016/j.foodqual.2010.03.006

Barton, J. J. S., Sekunova, A., Sheldon, C., Johnston, S., Iaria, G., &Scheel, M. (2010). Reading words, seeing style: The neuropsychology of word, font and handwriting perception. Neuropsychologia, 48(13), 3868–3877. doi:10.1016/j.neuropsychologia.2010.09.012

Carpenter, J. S., & Neal, J. G. (2005). Other complementary and alternative medicine modalities: acupuncture, magnets, reflexology, and homeopathy. *The American Journal of Medicine*, *118*(12), 109–117. doi:10.1016/j.amjmed.2005.09.058

Cela, E., & Kaneko, S. (2011). Determining the effectiveness of the Danish packaging tax policy: The case of paper and paperboard packaging imports. *Resources, Conservation and Recycling*, *55*(9-10), 836–841. doi:10.1016/j.resconrec.2011.04.003

Chai, S., Szepan, U., & Alonso, J. (1997). *Bacillus subtilis* bacteriophage SPP1 terminase has a dual activity: it is required for the packaging initiation and represses its own synthesis. *GENE*, *184*, 251–256.

Conroy, S., & McIntyre, J. (2005). The use of unlicensed and off-label medicines in the neonate. *Seminars in Fetal and Neonatal Medicine*, *10*(2), 115–122. doi:10.1016/j.siny.2004.11.003

Eyles, P., Skelly, J., & Lou Schmuck, M. (2003). Evaluating patient choice of typeface style and font size for written health information in an outpatient setting. Clinical Effectiveness in Nursing, 7(2), 94–98. doi:10.1016/S1361-9004(03)00047-5

Jakobsen, M., &Risbo, J. (2009). Carbon dioxide equilibrium between product and gas phase of modified atmosphere packaging systems: Exemplified by semihard cheese. *Journal of Food Engineering*, *92*(3), 285–290. doi:10.1016/j.jfoodeng.2008.11.007

Kistrup Holm, V., Mortensen, G., Vishart, M., &Agerlin Petersen, M. (2006). Impact of poly-lactic acid packaging material on semi-hard cheese. *International Dairy Journal*, *16*(8), 931–939. doi:10.1016/j.idairyj.2005.09.001

Konev, S. V., Katibnikov, M. A., Bandarin, V. A., Niamaa, D., &Barkovskiĭ, E. V. (1975). [Luminescence study of the effect of temperature on the conformational state of fibrinogen]. *Biofizika*, *20*(4), 586–590.

Kuta, C., Koch, D., Hildebrandt, C., & Janzen, D. (1995). Improvement of products and packaging through the use of life cycle analysis. *Resources, Conservation and Recycling*, *14*, 185–198.

Macedo, I. S. M., Sousa-Gallagher, M. J., Oliveira, J. C., & Byrne, E. P. (2013).

Quality by design for packaging of granola breakfast product. *Food Control*, *29*(2), 438–443. doi:10.1016/j.foodcont.2012.05.045

Michael Kalsher, Wogalter, Michael, Racicot, Bernadette. (n.d.). Pharmaceutical container labels:enhancing preference perceptions with alternative designs and pictorials. Received 15 October 1994; revised 17 April 1995.

Patel, V., Branch, T., &Arocha, J. (2002). Errors in Interpreting quantities as procedures: The Case of pharmaceutical labels. *International Journal of Medical Informatics*, *65*, 193-211.

Qu, G., Wu, H., Hartrick, C. T., &Niu, J. (2012). Local analgesia adverse effects prediction using multi-label classification. *Neurocomputing*, *92*, 18–27. doi:10.1016/j.neucom.2011.08.038

Satia, J., Galanko, J., &Neuhouser, M. (2005). Food nutrition label use is associated with demographic, behavioral, and psychosocial factors and dietary intake among African Americans in North Carolina. *Journal of the American Dietetic Association*, *105*(3), 392–402. doi:10.1016/j.jada.2004.12.006

Shrank, W. H., Parker, R., Davis, T., Pandit, A. U., Knox, J. P., Moraras, P., … Wolf, M. S. (2010). Rationale and design of a randomized trial to evaluate an evidence-based prescription drug label on actual medication use. *Contemporary Clinical Trials*, *31*(6), 564–571. doi:10.1016/j.cct.2010.07.004

Stachurska, A., Pięta, M., Jaworski, Z., Ussing, A. P., Bruśniak, A., &Florek, M. (2004). Colour variation in blue dun Polish Konik and Biłgoraj horses. Livestock Production Science, 90(2-3), 201–209. doi:10.1016/j.livprodsci.2004.04.002

Stegemann, S., Ecker, F., Maio, M., Kraahs, P., Wohlfart, R., Breitkreutz, J., …Broegmann, B. (2010). Geriatric drug therapy: Neglecting the inevitable majority. Ageing Research Reviews, 9(4), 384–398. doi:10.1016/j.arr.2010.04.005

Wallace, L. S., Keenum, A. J., DeVoe, J. E., Bolon, S. K., & Hansen, J. S. (2012). Women's Understanding of Different Dosing Instructions for a Liquid Pediatric Medication. *Journal of Pediatric Health Care*, *26*(6), 443–450. doi:10.1016/j.pedhc.2011.06.006

Wu, F.-G., & Chen, C.-Y. (2009). Effects of color display, color name, color formation and color alignment on the screen layout usability of customized product color combinations. International Journal of Industrial Ergonomics, 39(5), 655–666. doi:10.1016/j.ergon.2009.04.004

Wu, F.-G., Chen, C.-Y., Lee, Y.-J., & Chen, R. (2010). Effects of color sample display and color sample grouping on screen layout usability for customized product color selection. Computers in Human Behavior, 26(1), 51–60. doi:10.1016/j.chb.2009.08.003

Zema, L., Sangalli, M. E., Maroni, A., Foppoli, A., Bettero, A., &Gazzaniga, A. (2010). Active packaging for topical cosmetic/drug products: A hot-melt extruded preservative delivery device. *European Journal of Pharmaceutics and Biopharmaceutics*, *75*(2), 291–296. doi:10.1016/j.ejpb.2010.03.007

Zupan, M., Kruschwitz, A., & Huber-Eicher, B. (2007). The influence of light intensity during early exposure to colours on the choice of nest colours by laying hens. Applied Animal Behaviour Science, 105(1-3), 154–164. doi:10.1016/j.applanim.2006.05.011