Single Portion Packaging And The Use Of User Test Protocols To Determine Patient Accesibility

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ABSTRACT

In 2015, the UK National Health Service (NHS) established a taskforce to review single portion food and beverage packaging, which has been identified as a potential challenge to users in hospitals. Hence, a study was undertaken to determine the suitability and accessibility of the current single portion packs. The packaging was assessed using ISO 17480 (*Guidelines for Accessible Packaging*), Annex D. The standard determines a pass or fail of packaging opening asking a panel 20 older adults to open a pack. A pack is recorded as a failure if within the 20 people cohort there is an example of pack being unable to be opened within the time limit (defined as 1 minute) or the overall satisfaction score ranks below 3 on a 5 point Likert scale.

Ten standard single portion packaging items were randomly selected for testing. The packs were chosen to reflect a broad range of food and beverage and packaging types.

The results showed that the standard provided useful assessment data, identifying that 70% of packs were so poorly designed that they failed to pass the standard, with 50% of the packs having examples that were uopenable by participants, whilst a further 20% rated poorly for satisfaction.

KEYWORDS

Packaging, accessibility, malnutrition

INTRODUCTION

Malnutrition in older people has been identified as a significant problem. A recent report published by BAPEN (British Association for Parenteral and Enteral Nutrition) estimates that nearly 3 million people currently suffer malnutrition in the UK, costing more than £19bn (approximately $14bn US Dollars) a year, [1]. A further report by this organisation ''Malnutrition among Older People in the community: Policy Recommendations for Change'', [2] estimated that nearly 10% of the population over the age of 65 in the UK, currently suffer some form of malnutrition, approximately 1 million people. It is not just in the community that malnutrition is seen to have a significant impact on the health of older people. A review paper by Schenker, [3] estimated 40% of UK hospital patients were malnourished with 60% at risk, with the. . .' average food intake less than 75% of that recommended, particularly among the elderly (*sic*).' Further studies have shown that older adults are five times more likely to be at risk of malnutrition than younger patients, [4-6].

In 2007, Australian researchers conducted a 1-day malnutrition prevalence audit across hopsital sites in the New South Wales Region and showed 51% (n = 777) to have some degree of malnutrition. [7] The report highlighted the difficulty experienced by some patients in opening food and beverage packaging with a number of these patients indicating that they did not eat the food because they could not open it. Further work by Walton, Williams, and Tapsell, [8] and Tsang, [9] has also identified inability to access food and beverage packaging as a contributing factor to malnutrition among older adults and disabled people in hospitals.

Work by Bell et al., [10] studied the relationship between grip strength and the difficulty to open packaging. The study measured 140 participants (mostly older adult inpatients) and 64 staff members recruited from local public hospitals. Data were collected using interviews,

questionnaires, observations and grip strength testing using a Jamar dynamometer. Several food and beverage packages were found difficult to open by at least 40% of patients. These included milk and juices (52%), cereal (49%), condiments (46%), tetra packs (40%) and water bottles (40%). The difficulties were attributed to ‘fiddly’ packaging, hand strength and vision; however, only tetrapacks demonstrated a relationship between time taken to open and hand strength, suggesting other aspects of hand function may be more important than strength when opening food and beverage packages. [10]

Interest in understanding accessibility of packaging has grown as an area of study in recent years, largely concentrating on food packaging in the retail sector, [11-15] and to a lesser degree pharmaceutical packaging. [16-17] Pressure to understand and eliminate what has been termed 'Wrap rage', [18] led to the development of user panel tests for packaging assessment. The first of these was developed as a European Technical specification, CEN15945, published in 2011. [19] Subsequent use led to the refinement of the test protocol, and the inclusion of the test protocol as an Annex to an ISO standard '*Guidelines for Accessible P~~a~~ackaging*' ISO17480 (20). The international standard was launched in early 2015 after several years of development. The guideline outlines useful information for packaging designers and manufacturers about font size and type, contrast, reductions in strength, dexterity and cognition along with a designer checklist.

The test protocol employed is inspired by the principles described in an earlier series of published standards for testing child resistant packaging and the design requirements and testing the ease of use of everyday products. [21-25] Hence, in Annex D of ISO17480 an older cohort of 20 people, with specified representation of gender and age range from 65-80 years, are asked to open a pack and rate that packaging on a series of pictorial satisfaction scales and give an overall satisfaction rating.

In 2015, the UK National Health Service (NHS) set up a taskforce, comprised of representatives form a range of interested parties, including, NHS professionals, hospital caterers, industry supplier, NHS supply chain and academia, to look at the problem of poorly designed single portion packaging and possibility of implementing a strategy of removing it from the supply chain.

Hence, as a starting point, it was decided to undertake research to understand the following;

- the current situation by undertaking a pilot study to assess the 'state of the art', how accessible single portion packaging purchased by the NHS
- to use the Annex D of ISO17480 described above as a way of assessing the packaging
- identify if this Annex could select poorly performing packaging
- provide insight into the reasons why the packaging was failing (and hence how the packs could be redesigned) and implications for patients mealtime experience

METHOD

As outlined previously, the method used to assess the packs was similar to that proposed by the User Panel Test method CEN15945 (2011) and Annex (D) of ISO 17480 (2015).

The test panel participants are skewed towards females (70 % of the panel make-up) with an upper age limit of 80 years. In this test, four different NHS sites were involved in the study, participants were randomly selected from patient representative groups from each hospital.

Participants are asked to familiarize themselves with each packaging item and then subsequently attempt to open the packaging. For the purposes of this research participants

were asked to only give a rating of their overall satisfaction on the opening experience. Packaging is rated on a Likert scale (the scale is defined in the standard). For the purposes of a pass or fail of the pack the ratings of "Extremely Dissatisfied", "Dissatisfied" etc., are converted to a score (1 for "Extremely Dissatisfied", and 5 for "Extremely Satisfied"). A pack is recorded as a failure if within the 20 people cohort there is an example of pack being unable to be opened within the time limit (defined as 1 minute) or the overall satisfaction score ranks below 3 ("Satisfied"). The test can be repeated on another cohort if there is a likelihood that the number of failures will remain below two or the likelihood of a score of 3 ("Satisfied") can be attained. The number of permitted failures allowed increases as the cohort size increases. The test is stopped completely when the number of participants reaches 100.

Whilst ISO17480 does not request measurement of strength or dexterity it is of interest to understand the possible relationship between capability and the likelihood of opening the pack. To that end grip strength of each participant was measured using a Jamar Dynamometer whilst dexterity was measured using a Perdue Pegboard. Both instruments have significant published normative data for which our sample population could be compared. The measurements were taken by project lead with a significant track record in observing, measuring and analysing the capabilities of older adults. The tests were undertaken as per defined protocols provided with the instruments.

Ten standard single portion packaging items were randomly selected for testing. The packs were chosen to reflect a broad range of food and beverage and packaging types as possible and to facilitate comparisons to earlier work undertaken by Australian researchers. All the packs were familiar to the participants and all participants had opened that pack or similar pack prior to testing. The packaging was also chosen to mostly reflect the common packaging formats used, i.e. 'flow-wrap' items, lidded-pots and shrink-wrap. The packaging

chosen was single portion, cheese, jam, jelly, crackers, spread, orange juice, fruit pot, biscuits milk and sandwiches.

Twenty participants were chosen with their age and gender profile matching that as defined by the ISO standard protocol. Each participant opened all ten packs with a break between packaging opening events. The order in which packaging was presented to each participant was also randomised. For each participant their grip strength for each hand, dexterity, time to open each pack (or failure) was recorded along with a satisfaction score and any other comments made by the participant around the opening experience. Data were analysed using the Statistical Package for the Social Sciences V24 (SPSS 21, 2016, IBM Chicago, IL.). Satisfaction ratings, time to open the pack, grip strength and dexterity were analysed using descriptive statistics. Correlations using Spearman's rho was used to determine any relationships between grip strength and dexterity with time to open the pack and satisfaction ratings. Ethical approval was obtained from Sheffield Hallam University.

RESULTS

The results indicated that seven of the ten packs tested failed the ISO standard panel test. Five packs; jam, cheese, biscuits and the fruit pot failed due to participants being unable to open the contents in the allotted time with milk and sandwiches failing due to being rated below 3.

The mean age, dexterity and strength for male and female participants is shown below in Table 1. The dexterity data has been rounded down to the nearest whole number. Table 2 below, shows the mean opening time, number of failures the mean score for each of the items tested.

Statistical analysis of the results revealed that for the five items that were uopenable, the Fruit Pot, Jam and Biscuits time to open was more highly correlated with participants strength (Fruit Pot, r = -0.64, P = 0.006, Jam, r = -0.46, P = 0.071, Biscuits, r = -0.46 P = 0.057). The single portion cheese item that also was also uopenable by a number of participants, was most highly correlated to a participants dexterity (Cheese r = -0.52 P = 0.069). The fifth uopenable pack, the single portion Crackers item, was not highly correlated to either strength or dexterity. Large and significant correlations were found between the time to open many of the packs and the satisfaction rating, as shown in Table 3 below.

DISCUSSION

The aims of this study were twofold. The first was to gain an initial understanding of the accessibility of single portion packaging purchased by the NHS. The second aim was to use Annex D of ISO17480 as an assessment method of the packaging to determine if this Annex could select poorly performing packaging and identify issues and the pack attributes. Clearly, the results show that the ISO17480 user panel test is able to select poorly performing packaging items, with this study showing that it is likely a significant amount of single portion packaging sourced by the NHS would currently fail testing as per Annex D of ISO17480. The study found that 50% of the ten packs tested in this instance could not be opened, whilst a further 20% failed because of a low satisfaction score. Hence, 70% of the packaging tested would fail the standard and is likely to be unopenable by a significant proportion of hospital patients. The items that failed outright were single portion jam, cheese, fruit pot, crackers and biscuits. Cheese, crackers and the jam portions were seen to be the worst performing items with 6, 4 and 3 failures to open these items respectively.

The 70 % failure rate of packaging is based on a test panel with an age limit of 80 years old. Clearly, there will be and are patients older than this within the NHS healthcare

system. Indeed, as the population ages, older adults are increasingly over-represented in the hospital system and many of the older old have complex medical conditions and high levels of frailty. Further, the patient representatives were all independent living well adults, hence it is likely that the panel test under predicts a patients inability to open packaging of this type.

Discussions with catering and nursing staff indicated that patients were in many cases helped to open packaging which may mitigate some of the problems with poor packaging. However, discussions with patients indicated there were instances of packaged items remaining unopened. Recent research by Bell (personal communication) has found that many patients are reluctant to ask nursing or catering staff for assistance to open packs as they would either prefer to be independent, or feel the ward staff are too busy to ask.

Further, it was seen that the types and amount of packaging used varied significantly from hopsital to hospital and was seen to depend on experience with certain types of packaging (and a subsequent willingness and ability to remove it from the system), hospital size and layout, catering facilities, interpretation of hygiene rules and cost.

Whilst capability measurement is not stipulated as part of the ISO 17480 user panel test, hand grip strength and dexterity were measured as part of this study. The fruit Pot, Jam and Biscuits were seen to be correlated to a user's strength whilst the Cheese portion the items were seen to be related to dexterity. The time taken to open a pack was significant in the rating score of many of the packs

In the study by Bell et al., [10] users described their frustration at their inability to open packaging describing many items as 'fiddly'. This led researchers to hypothesize that the relationship between this perceived ‘fidliness’ is not related to strength but a person's dexterity. Further work by the authors has shown that links between dexterity and some single portion packaging can be identified, however the results here suggest that inability to

access single portion packaging may be more nuanced. For example, little correlation was seen in the packs tested here and the measured dexterity (apart from Cheese). This difference could be possibly be explained by the example of the crackers, which had multiple failures in attempting to open the pack. Observations showed that the typical grip style used to attempt to open this type pack is a low strength pinch grip and this style of grip is actually used to open a number of items tested in this study. (It is again worth noting that ISO17480 does not stipulate capability measurement as part of the protocol.)

Precision pinch grip was not measured as part of this study, however observations suggest that it is the kind if grip used for many of the typical single portion packaging items and that there is a potential relationship between pinch grip and accessibility. Hence, future work should measure pinch grip strength rather than gross hand grip strength. Further, the number and simplicity of the tasks required to undertake the opening event will clearly affect a user's opening time and satisfaction rating and those tasks may have elements of dexterity, pinch and grip strength. Work is ongoing by the authors to understand the relationship between number and simplicity of tasks utilising a task analysis approach based on the ergonomic ideas by Stanton; [26] this work was presented at the Design4Health Conference in Melbourne. [27]

The example of crackers also shows how poor design affordances and graphical information work against the participant. In this instance no participants noticed the arrow on the indicating the point to open the pack and all participants attempted to open the pack pulling against the pack spine rather than tearing across the seal. Small design changes and more prominent opening information would aid in changing the patient experience and increase the likelihood of opening. The best performing pack, the spread item, had a strong opening affordance with a large easy accessible and prominent tab on the size of the pack which was clear to see, easy to hold and separated the pot and lid easily and effectively.

Work by Yoxall, [28] has shown that packs with low cognitive demands and lower dextrous demands are more likely to be accessible.

It is hoped that by implementing the ISO standard into the purchasing guidelines, poorly designed packaging will drop out of the system as suppliers and brand owners select packaging that meets the standard, and that the process of certification will create a loop where failed packaging will be redesigned and re-tested, creating a loop of progress towards a better design of single portion packaging.

CONCLUSIONS

Poorly performing packs that were generally difficult to open largely failed due to participants being unable to locate the opening feature, and if or when located, manipulate the pack in such a way that would facilitate access. It is recommended that the next steps be (1) packaging testing to be incorporated into NHS food packaging purchasing guidelines or contracts, and (2) assessment of the packaging be part of the Patient Led Assessments of the Care Environment (PLACE) protocol to aid best practice around food packaging accessibility and use into the NHS supply chain system. In incorporating this protocol, it is anticipated that the NHS will drive the development of the design of single portion packaging and improve patient experience and wellbeing. This change will be the result of poorly performing packing being removed from the system and the likelihood of manufacturers and suppliers engaging with the findings of tested packaging to improve the designs to ensure compliance with the protocol. Further, it is likely that as a major purchaser of single portion packaging the implementation of the standard will influence single portion packaging in other sectors. Many of the items purchased by the NHS are also used in canteens, hotels, service stations, prisons and airlines; hence this work has the potential for significant impact across a range of sectors.

TAKE AWAY POINTS

1. The results show that ISO 17480 is able to identify poorly performing single use packaging of the type commonly used in the hospital catering sector.
2. This pilot study indicated that 70% of the packaging tested in this study fails the ISO 17480 user test protocol.

2. For packing to be properly and routinely accessible, it should have opening features and opening mechanisms that are intuitive and/or clearly identified, opening mechanisms such as tabs large enough to grip, the use of stronger grip taxonomies where possible and low peel and tear forces as possible.

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