MARCH
2015
Table of Contents

Articles

KNOWLEDGE, ATTITUDE AND FREQUENCY OF READING FOOD LABELS OF MALES AND FEMALES IN MUMBAI CITY
Dr. Rekha Battalwar, Rabab Gupta

ISSN: 2347-7555
KNOWLEDGE, ATTITUDE AND FREQUENCY OF READING FOOD LABELS OF MALES AND FEMALES IN MUMBAI CITY

Dr. Rekha Battalwar¹
Associate Professor, Department of Food and Nutrition, S.V.T. College of Home Science (Autonomous), S.N.D.T. Women’s University, Mumbai, India
Email: drekhhab12@gmail.com

Rabab Gupta²
Student, IGNOU, India
Email: rababgupta@gmail.com

ABSTRACT

India, one of the dominant emerging economies, is witnessing unprecedented boom in the organized retail growth. Consumption of processed and packaged food items has grown tremendously in the recent past. A cross sectional study was conducted in 200 (100 males) from Mumbai city, India. A pre-tested structured and undisguised questionnaire was used to collect information regarding knowledge of food labels, frequency of reading food labels and components of food labels; reasons for not reading food labels and ease of understanding. Analyses were performed using SPSS software for Windows (version 16.0, 2007, SPSS Inc, Chicago, IL). All 200 subjects had knowledge about food labels. 21% adults purchased packaged food more than once a week, 48.5% purchased it once a week, 26% purchased it once in 2 weeks and 4.5% purchased in once in a month. 2% read food labels every time, 38.5% read it often and 59.5% read it sometime. Gender was significantly associated with the frequency of buying packaged foods ($\chi^2 = 33.787$) and reading food labels ($\chi^2 =19.998$) with higher percentage of males purchasing packaged food more than once a week and reading food labels always ($p<0.05$). Significantly higher percentage of males reported that they do not read food labels as its time consuming, do not understand the meaning of the information printed and labels are too small as compared to females ($p<0.05$). A positive significant association of gender with frequency of reading brand name, ingredients, expiry date, health claim, nutritional information, preservatives used, storage information and cooking instructions was observed ($p<0.05$). The usage of the information printed on packaged food is relatively low amongst the consumers while buying packaged food products. Despite a high frequency of purchasing packaged foods, the percentage of males and females reading food labels and components of food labels on a regular basis is very small.

Keywords: Packaged Food; Food Labels; Health Claims; Nutritional Information; Consumers

INTRODUCTION

Over the past few years there has been a considerable amount of change in the food consumption pattern of the Indian population. Demand for healthy and wellness food is also on rise. With the change in lifestyle and consumption pattern, food safety standards are becoming important from public policy perspective (Wang et al, 2008). Food product labeling, as a policy tool for ensuring provision of nutrition and health information to consumers and as product differentiation strategy by food companies, has gained importance in the recent past across the globe (Kim, Nayga and Capps, 2001).
Many studies found that, in general, consumers were confused with nutrition label information, especially with the use of some technical and numerical information (Unusa, 2004; Feunekes et al., 2008; Kelly et al., 2009). One of the important information which is found on the packaged food these days includes Health Claims. The presence of a combination of both, shorter health claims on the front of the package and a more complete valid information on the back, leads the consumer to give more attribute specific thought regarding the product. (Wansink et al, 2003). Longer claims may lead to general evaluated thought. Shorter claims may lead to more favorable beliefs about the product and thereby a more positive image of the product (Health Canada, 2000).

New forms of food labeling and ‘front-of-pack’ nutrient signposting in particular, are viewed as potential tools for improving the nutrition of the population (Nestle and Jacobson, 2000). A number of different front-of-pack nutrient signposting have been developed (Grunert and Wills, 2007) and the most effective format has been vigorously debated (Lobstein et al., 2007). In 2006, the UK Food Standards Agency (FSA) recommended that food retailers and manufacturers in the UK place front-of-pack traffic-light labels on products in a range of categories. The FSA states that a key objective of this traffic-light labeling is to help people make healthier food choices (Food Standards Agency, 2008). It is proposed that the focus with food label research should divert to consumer education (Macanda, 2005), and should therefore explore ways to educate consumers of all walks of life to use food labels more purposefully during the various stages of the consumer decision-making process, in order to empower consumers to use food label information to their best advantage.

OBJECTIVE

1. To assess how frequently the consumers read food labels.
2. To study the knowledge, attitude and perception of males and females towards food labeling.
3. To assess consumer preference towards most commonly used Health Claims.

REVIEW OF LITERATURE

There are many important diet related public health problems and diseases such as poor nutrition; obesity high blood pressure; cancers, diabetes; osteoporosis and cardiovascular diseases. The World Health Organization reported that dietary factors accounted for approximately 30% of cancers in industrialized countries. Therefore, nutrients are vital to humans for growth and maintenance of good health (WHO/FAO, 2003). Most of the pre-packaged food products; imported and locally manufactured; are now provided with nutrition information on their food labels. Overseas experience has shown that nutrition labeling can have positive impact on food consumption patterns; save healthcare costs and the increasing diseases each year. With the introduction of mandatory nutrition labeling many lives could be saved each year (Hawkes, 2004). When asked about their use of nutrition labels on food products, most consumers claim looking at nutrition labels “usually”, “often”, or “at least sometimes”, when making food purchases (Bredbenner B. et al., 2000; Cowburn and Stockley, 2005; Satia et al., 2005; Mhurchu and Gorton, 2007).

In some studies, one fifth to one third of respondents have replied as “always” checking nutrition labels (Nielsen M., 2005), whereas in a Turkish study, about 46% of males and 40% of females were found not to read nutrition labels, at all (Bozkır, 2009). Nevertheless, the results of such surveys are known to vary considerably with country, time, categories of consumers and the pattern of questions asked (Cheftel, 2005). Through product exposure (such as products on display in a store) and continuous learning (such as messages conveyed in media), consumers assess new product information within their existing knowledge frameworks. This may cause changes in attitudes and behaviour, i.e. product-related consumer socialization. Product labels are therefore ideal tools to facilitate consumers’ decisions and to educate consumers, provided that consumers know how to interpret these labels, such as understanding that food contents are indicated in descending order.

It is, unfortunately, difficult to teach or assist less educated consumers to make use of food label information. In this regard, initiatives such as front-of-pack labeling (including traffic light labeling)
may help to explain nutritional information and to quickly identify healthier food alternatives (Kelly et al., 2009). Traffic light labels reduce the cognitive activity required to analyze and interpret food label information and can reduce the intricacy of food purchase decisions considerably (Hieke and Wilczynski, 2011). It is proposed that the focus with food label research should divert to consumer education (Macanda, 2005), and should therefore explore ways to educate consumers of all walks of life to use food labels more purposefully during the various stages of the consumer decision-making process, in order to empower consumers to use food label information to their best advantage.

METHODOLOGY

A cross sectional study was conducted in 200 (100 males) from Mumbai city, India. A pre-tested structured and undisguised questionnaire was used to collect information regarding knowledge of food labels, frequency of reading food labels and components of food labels; reasons for not reading food labels and ease of understanding. It focused on the attitude of consumers towards food labelling and their understanding towards the nutrition information given on food labels. The study attempted to determine whether consumers actually grasp and understand the nutritional information written on food labels and how far do they follow it and get influenced by the health claims given on the food product.

Statistical Methods

Analyses were performed using SPSS software for Windows (version 16.0, 2007, SPSS Inc, Chicago, IL). Data are presented as frequency (percentage). The frequency distributions were tabulated for various parameters by gender and were compared using cross tabulations and chi-square test. P-value < 0.05 was considered to be statistically significant.

RESULTS

Many consumers feel confident that they understand how to read labels and prefer using a food label than relying on their own knowledge (Godwin et al., 2006). Most of the shoppers look at food labels for information about content and preparation, reflecting both the growing interest in healthy eating, as well as concern about what ingredients are there in the foods they eat (Cragg Ross Dawson, 2004). In the present study knowledge regarding food labels on 200 (100 males) is presented. All 200 subjects in the current study knew about food labels and reported that food labels are present on canned, frozen and packaged foods. The knowledge and purchasing patterns of packaged food were compared according to the gender.

Off the 200 subjects, 42 (21%) purchased packaged food more than once in a week, 97 (48.5%) purchased it once a week, 52 (26%) purchased it once in 2 weeks and 9 (4.5%) purchased in once in a month. There was a significant association between gender and frequency of buying packaged food with higher percentage of females purchasing packaged food more than once a week ($\chi^2 = 33.787$, p<0.05).

![Figure 1. Frequency of purchasing packaged food according to gender](image-url)
A number of studies from the UK, US and Australia, as well as one from Sri Lanka, have found that women are more likely to consult nutrition labels when purchasing products than men. This may be attributed to the fact that men are less likely to agree that nutrition information on labels is useful and are generally less interested in nutrition and health than women.

In the present study, however, Off the 200 subjects, 4 (2%) read food labels every time, 77 (38.5%) read it often and 119 (59.5%) read it sometime. There was a significant association between gender and frequency of reading food labels with higher percentage of females reading food labels every time or often as compared to males ($\chi^2 = 19.998$, $p<0.05$) (Figure 2).

![Figure 2. Frequency of reading food label according to gender](image)

A number of studies indicate that many, if not most, consumers do not have the time to read and absorb the messages on food labels outside of experimental conditions. Feunekes, et al found that “in a supermarket environment, consumers generally have limited opportunity to process information, and their motivation to do this is likely to be low when shopping for groceries, resulting in relatively superficial processing of information” (Feunekes, et al, 2008). Peters-Texeira and Badrie (2005) found that 36.6% of consumers found food labels too confusing or too time-consuming to read, and that most respondents spent only 30 seconds reading the food label. Similarly in the present study, reasons for not reading food labels every time while purchasing packaged foods were analysed. 149 (74.5%) reported that its time consuming, 10 (5%) reported that they don’t understand the meaning of the information printed, 146 (73%) reported labels are too small, matter is not readable, 15 (7.5%) reported that as they don’t have health problem and don’t need to read labels and 12 (6%) reported that their choices are healthy and don’t need read food label. All 200 subjects reported that the language of food label was easy to understand. Significantly higher percentage of males reported most reasons of not reading food label as compared to women ($p<0.05$).

<table>
<thead>
<tr>
<th>Reason</th>
<th>Males</th>
<th>Female</th>
<th>Chi-square</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>It’s time consuming</td>
<td>62</td>
<td>87</td>
<td>16.45</td>
<td>0.001</td>
</tr>
<tr>
<td>Don’t understand the meaning of the information printed</td>
<td>8</td>
<td>2</td>
<td>3.789</td>
<td>0.052</td>
</tr>
<tr>
<td>Labels are too small, matter not readable</td>
<td>80</td>
<td>66</td>
<td>4.972</td>
<td>0.026</td>
</tr>
<tr>
<td>Don’t have health problem and don’t need to read labels</td>
<td>9</td>
<td>6</td>
<td>0.649</td>
<td>0.421</td>
</tr>
<tr>
<td>My choices are healthy and don’t need to read food label</td>
<td>10</td>
<td>2</td>
<td>5.674</td>
<td>0.017</td>
</tr>
</tbody>
</table>

One hundred and ninety five (97.5%) subjects spent 1-5 minutes reading labels whereas 5 (2.5%) spent 5-10 minutes. There was no significant association between gender [males: 96 spent 1-5 minutes, 4 spent 5-10 minutes; females: 99 spent 1-5 minutes, 1 spent 5-10 minutes] and time spent reading food labels ($\chi^2=1.846$, $p=0.174$).
One hundred and twenty nine subjects reported that they read food labels at the store, 9 read it at home, 64 read it both at store and home and none of the subjects read food labels online. Significantly higher percentage of females (85) read labels at store as compared to males (44) ($\chi^2$=36.707, p<0.05). On the other hand number of males reading label at home (9) ($\chi^2$=9.424) and at both places (50) ($\chi^2$=29.779) was significantly higher than females [home (0), both places(14)] (p<0.05).

Labels of food products can be used to shape consumers’ beliefs and/or feelings about a product, for example claiming that a particular food product is “fat free” or “nutritious”. In essence, food choices are significantly prejudiced if consumers are unable to understand label information (Jacobs et al, 2010), because consumers then typically ignore the information or might even reject the product in favour of another of which the label information seems more clear and useful (Silayoi and Speece, 2004).

In a pan-country study (AC Nielson, 2005, cited in Ni Mhurchu, 2006) almost half (49%) of respondents stated that fat was the nutrient that they most often checked labels for, while 43% said calories (energy) and 42% sugar. Similar findings were reported in a 2005 UK consumer survey where the most commonly checked nutrients on food labels were fat (56%), salt (44%) and sugar (44%) (TNS Research, 2005). Calories especially are seen as important for many women (often slightly older women) due to the link historically with ‘calorie controlled diets’ and current link with organizations which aim to help people to lose weight (Synovate, 2005). The least accessed nutritional information related to protein, carbohydrates and vitamins (TNS Research, 2007). In the present study frequency of reading various components of food labels was assessed. Off the 200 subjects, 175 (87.5%) read brand names, 77 (38.5%) read ingredients, 87 (43.5%) read expiry date, 12 (6%) read health claims, 7 (3.5%) read storage information, 21 (10.5%) read cooking instruction always. None of the subjects read nutritional information, preservatives used, serving size, country of origin and allergens always. There was a significant association of gender with frequency of reading brand name, ingredients, expiry date, health claim, nutritional information, preservatives used, storage information and cooking instructions (p<0.05) (Table 2). There was no significant association of gender with serving size, country of origin and allergens (P>0.05) (Table 2).

Table 2. Frequency of reading various components of food label according to gender

<table>
<thead>
<tr>
<th></th>
<th>Always</th>
<th>Often</th>
<th>Occasionally</th>
<th>Rarely</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brand name</td>
<td>93</td>
<td>6</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ingredients</td>
<td>68</td>
<td>28</td>
<td>6</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Expiry Date</td>
<td>69</td>
<td>32</td>
<td>6</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Health claims</td>
<td>59</td>
<td>22</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Nutritional Information</td>
<td>60</td>
<td>45</td>
<td>5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Preservative used</td>
<td>69</td>
<td>32</td>
<td>6</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Storage information</td>
<td>63</td>
<td>28</td>
<td>5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cooking instructions</td>
<td>62</td>
<td>31</td>
<td>5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Serving size</td>
<td>62</td>
<td>31</td>
<td>5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Country of origin</td>
<td>62</td>
<td>31</td>
<td>5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Allergens Present</td>
<td>62</td>
<td>31</td>
<td>5</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Off the total sample size of 200, 199 (99.5%) said that they found low fat/cholesterol free as the most attractive health claim while buying packaged food, 112 (56%) said that they found low calorie as the most attractive health claim while buying packaged food, 81 (40.5%) said that they found sugar free as the most attractive health claim while buying packaged food, 73 (36.5%) said that they found high fibre/whole grain as the most attractive health claim while buying packaged food, 39 (19.5%) said that they found 100% natural as the most attractive health claim while buying packaged food, 19% said that they found no preservatives as the most attractive health claim while buying packaged food, 15 (7.5%) said that they found fortified with extra vitamins and minerals as the most attractive health claim while buying packaged food, 14 (7%) said that they found diet food as the most attractive health claim while buying packaged food, 5 (2.5%) said that they found organic food as the most attractive health claim while buying packaged food and 4 (2%) said that they found low sodium as the most attractive health claim while buying packaged food.
Majority of the females found low fat/cholesterol (100%), low calorie (77%) and high fibre/whole grain (42%) as the top three attractive health claims while buying packaged food whereas majority of the males found low fat/cholesterol free (99%), sugar free (47%) and low calorie (35%) as the top three attractive health claims while buying packaged food. (Figure 3)

No significant association of amount of information and gender was found ($\chi^2=4.222$, $p>0.005$) whereas a significant association of ease of information and gender was found ($\chi^2=16.667$, $p<0.001$). There was no significant association of gender with ease of understanding ingredient list ($\chi^2=0.5646$), understanding health claim ($\chi^2=1.684$) and understanding nutritional information ($\chi^2=3.046$) ($p>0.05$) (data not shown).

CONCLUSION

The usage of the information printed on packaged food is relatively low amongst the consumers while buying packaged food products. Despite a high frequency of purchasing packaged foods, the percentage of males and females reading food labels and components of food labels on a regular basis is very small. Information overload of food labels makes it too time consuming for consumers as it is difficult for them to remove time from their busy schedule and read in detail labels of all the packaged food products that they buy. Another important reason for not reading food labels highlighted here is that labels are too compact and small and it is quite difficult for consumers to read the label without straining their eyes, hence, it becomes impossible for elderly consumers or consumers having difficulty in reading to go through the information printed on labels. Use of Front of Pack (FOP) labelling like the traffic signal format for displaying the nutritional information will be of great help as it is easily understood by a person who is not highly educated and thus will be able to make a healthy choice. Also, it will be less time consuming for the consumers as they will have to just glance on the front side of the pack to know the nutritional value of the product and to judge whether what they are eating is healthy or not. General awareness and education programme regarding food labels need to be planned to increase awareness especially in males.

REFERENCES


15. TNS Research, 2005. Quantitative research on participants’ perceptions and use of nutrition, health and related claims on packaged foods, Food Standards Australia New Zealand.


April
2015
Table of Contents

Articles

N DIMENSIONAL EYE
Hatim Kanpurwala 1-3

TO TRY TO EXPLAIN AND RECONCILE HEISENBERG’S UNCERTAINTY PRINCIPLE AND EINSTEIN’S COUNTER ARGUMENT “GOD DOES NOT PLAY DICE” WITH RESPECT TO QUANTUM COMPUTING
Hatim Kanpurwala 4-6

ISSN: 2347-7555
N DIMENSIONAL EYE

Hatim Kanpurwala
Consultant, Mumbai, India
Email: hatimk@rediffmail.com

ABSTRACT

Here we will try to present several Hypotheses and theories as to how to represent an ‘n’ dimensional object or space in 3-Dimensions. The aim or goal being that the any static object occupying some space/volume can only be represented or perceived in 3-Dimensions. Time being the fourth dimension if the object is in motion. In case the object/space is an ‘n’-Dimensional object as given by the co-ordinates obtained using sensors and outlined in my earlier papers – please see References 1, 2, 3, 4 and 5 given in the References section and assuming as a norm that a point of an object/space has only length breadth and height (i.e. x coordinate, y coordinate and z coordinate) and all points on the object have only x, y and z co-ordinates respectively only as perceived by the Human eye then the question is how do we represent the n-dimensional points in 3-dimensions. As a precondition each of the co-ordinates are independent of each other for them to be ‘n’ dimensional co-ordinates.

Keywords: Dimensional Eye

METHODOLOGY

Let there be e.g.
‘m’ points (P_m) in ‘n’ dimensions which can be represented as
P_m(x1, x2, x3…xn) for points of an object ‘O’

**Hypothesis 1:** If we keep any 3 co-ordinate axes of the ‘n’ axes constant and we attempt to map the remaining ‘n-3’ co-ordinate axes or points on the remaining ‘n-3’ co-ordinate axes to the designated 3 constant dimensions, if we can prove that

Assuming x1, x2 and x3 co-ordinate axes are constant, then If prove that,

\[ x4 = F4(x1,x2,x3) \]

where F4 is some function of x1, x2, and x3 and x4 is a point on the 4th dimension,

Similarly for x5, x6, and xn, then

We can say that x4, x5, x6…xn are convergent or inflection points of the remaining ‘n-3’ axes on the 3 constant dimensions. Also it is my belief that if for all points P_m x4 is = F4(x1, x2, x3) and similarly for x5, x6, xn then the object may be termed as a Regular object in ‘n’ dimensions.

**Hypothesis 2:** For Irregular objects, If we keep any 3 co-ordinate axes of the ‘n’ axes constant and we attempt to map the remaining ‘n-3’ co-ordinate axes or points on the remaining ‘n-3’ co-ordinate axes to the designated 3 constant dimensions, if we can prove that

Assuming xi1, xi2 and xi3 co-ordinate axes for point ‘i’, then if

If prove that,

\[ xi4 = Fi4(xi1,xi2,xi3) \]

where F4i is some function of xi1, xi2, and xi3 and xi4 is a point on the 4th dimension,
for i=1, 2, 3, 4….m for ‘m’ points

Similarly for xi5, xi6, and xin, then

We can say that xi4, xi5, xi6…xin are convergent or inflection points of the remaining ‘n-3’ axes on the 3 constant dimensions.

**Hypothesis 3:** If we keep any 3 co-ordinate axes of the ‘n’ axes constant and we attempt to map the remaining ‘n-3’ co-ordinate axes or points on the remaining ‘n-3’ co-ordinate axes to the designated 3 constant dimensions, if we can prove that

Assuming x1, x2 and x3 co-ordinate axes are constant, then if

If prove that,

\[ x_i = F(x_1, x_2, x_3) \]

where F is some constant function of x1, x2, and x3 and \( x_i \) is a point on the i-th dimension,

Here again we can say that \( x_i \) are convergent or inflection points of the remaining ‘n-3’ axes on the 3 constant dimensions. Also it is my belief that if for all points \( P_m \) \( x_i = F(x_1, x_2, x_3) \) then the object may be termed as a Regular object in ‘n’ dimensions.

N.B. But we have stated that each of the ‘n’ dimensions is independent of each other, hence Hypothesis 1, Hypothesis 2 and Hypothesis 3 may not necessarily hold to be valid.

**Hypothesis 4:** Again, if we keep any 3 co-ordinate axes of the ‘n’ axes constant and we attempt to map the remaining ‘n-3’ co-ordinate axes or points on the remaining ‘n-3’ co-ordinate axes to the designated 3 constant dimensions, if we can prove that

Assuming x1, x2 and x3 co-ordinate axes are constant, then if

If prove that,

\[ x_i = F(c) \]

where F is some constant/variable function (as shown in Hypothesis 3) or alternatively a variable function (as shown in Hypothesis 1 and 2) of a complex number/variable ‘c’ and \( x_i \) is a point on the i-th dimension, then

We can say that \( x_i \) are ‘truly’ points of the remaining ‘n-3’ axes on the 3 constant dimensions as the complex number/variable ‘c’ is independent of any of the ‘n’ dimensions and on the 3 dimensions on which the mapping is to take place. Also it is my belief that if for all points \( P_m \) \( x_i = F(c) \) then the object may be termed as a Regular object in ‘n’ dimensions. The complex number/variable could consist of a real number component and/or a time/angular dependent component which is independent of x1, x2 and x3 (e.g. we could construct a numeric function or some function of either the remaining ‘n-3’ dimensions or some function independent of each of the axes x1, x2, x3, x4, x5… xn.

N.B. Each of the axes x1, x2, x3, x4, x5, …..xn are supposed to be orthogonal to each other in ‘n’ space.).

Or alternatively F(c) could be some Function of ‘c’ such that it is not dependent on x1, x2 or x3 for any of the points \( P_m \) for the remaining ‘n-3’ dimensions.

**Potential Applications**

1. The above procedure might enable us in imaging applications of ‘n’ dimensions.
2. It might enable us to detect new Life forms/organisms.
3. It might enable us in the domain of Astro-Physics for better visualization of the universe.
4. It might enable us to detect/observe and build effective Pharmaceutical drugs, Biological processes/chemistry, virus/germ detection/control, Genetics and Healthcare and Disease Control etc. in general.
5. It might enable us to detect/build more effective Chemicals and/or Materials by knowing their properties better.

6. It might enable us in better Agricultural production by creation of better pesticides/fertilizers/seeds etc.

7. It might enable superior signaling and/or telecom services.

**Scope for Future Research**

1. If the above theories are applied to quantum mechanics and physics and the above applications are applied then it might take these applications to an entire new level.


**REFERENCES**

1. A method to determine co-ordinates of planetary objects/stars and other objects in the sky/space in 3-dimensional Euclidean Space with respect to Centre of the Universe – Mar 2012 Vol. I Issue III


4. Hatim’s Theory with respect to Einstein’s Theory on Speed of Light in Space and with respect to Space-Time Relationships/Anomalies in Space using Euclidean math – March 2013 Vol. II Issue III

TO TRY TO EXPLAIN AND RECONCILE HEISENBERG’S UNCERTAINTY PRINCIPLE AND EINSTEIN’S COUNTER ARGUMENT “GOD DOES NOT PLAY DICE” WITH RESPECT TO QUANTUM COMPUTING

Hatim Kanpurwala
Consultant, Mumbai, India
Email: hatimk@rediffmail.com

ABSTRACT
Researcher believe that Heisenberg believed that it was not possible to predict the location or paths of electrons/atomic particles in solid state matter which he stated in the form of the “Uncertainty Principle” as a counter argument I believe Einstein had supposedly stated that “God does not play dice” indicating that there must be some logic as to why the path/location of electrons in solid state matter could not be predictable. Here we try to reconcile the arguments of the above two principle investigators with a suitable explanation. Please note as a background we presume that co-ordinates or paths of electrons/atomic particles can be traced in space or solid state matter using suitable sensors and methodology outlined in the References (Please see the following References 1, 2, 3, 4 and 5).

Keywords: Quantum Computing

METHODOLOGY
Let us say we have an equation,

\[ x + 3 = 5 \]

this is a polynomial of order ‘1’ because ‘x’ is raised to the power of ‘1’.

Here the roots of the above equation is,

\[ x = 2 \]

(Subtracting 3 from each side of the equation we get the value of x as 2).

Similarly any other equation e.g.

\[ x^2 + 6x + 2 = 0, \]

Here this is a quadratic equation or a polynomial in x with the order ‘2’ as the highest power of x is ‘2’. We all know that quadratic equations have two roots \( \alpha \) and \( \beta \).

N.B. Roots of quadratic equations are given by \( x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \)

Where a,b, and c are coefficients of the quadratic equation

Similarly a polynomial in x with the order ‘3’ will have 3 roots and

A polynomial of order ‘n’ will have ‘n’ roots or ‘n’ values that satisfy the polynomial.

Now if the location of an electron/atomic particle is given by a polynomial of order ‘n’ it will have ‘n’ values along a particular axis say x-axis, similarly for a polynomial on the y and z axis respectively there will be ‘n’ roots or values. Now we can obtain from suitable permutations/combinations on the x, y and z axis the co-ordinates of the electron/atomic particle in 3 dimensions (and extendable to ‘k’ dimensions). Also we can safely conclude that at any given moment the co-ordinates of the electron /
atomic particle could be any of the above permutation/combinations depending on the ‘n’ roots or values the polynomial has and the energy of the electron/atomic particle at a given moment – hence satisfying Heisenberg’s Uncertainty Principle that the location/path of the electron/atomic particle is Uncertain. But as there are mathematical equations governing the roots of the polynomial it also satisfies Einstein’s counter argument “God does not play dice” as the specific locations/paths of the electron/atomic particle could be predicted. Hence as a result both Heisenberg’s Uncertainty Principle and Einstein’s counter argument are reconciled.

N.B. In last week’s Times of India Sci-fi section (Approximately 10/04/2015 – 20/04/2015 week) one of the Universities in the U.S. or Canada have shown that electron’s can be slowed down to speeds < than the speed of light and it is a well known fact in quantum mechanics/physics that electrons move between different states or energy levels travelling at the speed of light – this corroborates the above Hypothesis or theory.

As the electrons can be in multiple states at different energy levels at the same time, according to some estimates in $2^{10}$ states (Refer to Reference 6) enabling parallel processing and $2^{10}$ bit computing (often called Qsec bit or Quantum bit – again refer to Reference 6) while traditional devices / computers are only binary based ($2^1$ bit) and perform only serial processing. This would enable a whole new paradigm shift in computing.

Also note the above Hypothesis I believe may also aid us in tracing or tracking the elusive Higgs-Boson particle or the God particle in Particle Physics.

**Potential Applications**

1. Quantum computers/devices can result in more accurate/reliable/faster/robust and more powerful computing devices/computers/hardware and software.
2. Also as these devices are more powerful, more computing can be achieved for less resulting in higher redundancy and fault tolerance.
3. Also due to “shrinkage” of devices/hardware more datacenters can be fitted in the same building/room owing to miniaturization leading to again economies of scale e.g. now you might have a larger internet with more bandwidth utilizing fewer servers.
4. Also quantization will lead to greater security as the speed and economies of scale cannot be captured so easily (Refer to Reference 6 for more on this).
5. Also now certain algorithms/programs which used to take a few years to 100 years to compute could possibly be computed within seconds using Quantum computing compared to traditional computing. As a result the Time to Market of certain products/services could be drastically reduced e.g. in this age of Big Data with trillions of amount of Data to process and analyze Quantum computing could be a boost – this is not necessarily just in the case of the Internet but take Genome sequencing or Gene therapies this could possibly be realized in our lifetime.
6. Also the granularity of the communication and the bandwidth of the communication in terms of data rate, accuracy, reliability, and speed etc by communication devices/computers would be vastly improved using Quantum computing.

N.B. Communication can not necessarily by only video or audio or telecom signals it could include other sensory signals as well.

**REFERENCES**

1. A method to determine co-ordinates of planetary objects/stars and other objects in the sky/space in 3-dimensional Euclidean Space with respect to Centre of the Universe– Mar 2012 Vol. I Issue III
Sai Om Journal of Science, Engineering & Technology
A Peer Reviewed International Journal


5. Hatim’s Theory with respect to Einstein’s Theory on Speed of Light in Space and with respect to Space-Time Relationships/Anomalies in Space using Euclidean math – March 2013 Vol. II Issue III

Vol 2, No 5 (2015)
Sai Om Journal of Science, Engineering & Technology: A Peer Reviewed International Journal (Online ISSN 2347-7555)

Table of Contents

Articles

N DIMENSIONAL EYE - ADDENDUM
Hatim Kanpurwala 1-4

ISSN: 2347-7555
ABSTRACT

Here we will try to present several additional Hypotheses (Hypothesis 5, 6, 7, 8, 9 and 10) and theories as to how to represent an ‘n’ dimensional object or space in 3-Dimensions in addition to our earlier paper. Please note again the purpose of this paper is to explore and find ways of trying to represent ‘n’ dimensional objects/shapes in ‘3’ dimensions so that the unseen becomes seen to the Human eye.

Keywords: Dimensional Eye

METHODOLOGY

Let there be e.g.

‘m’ points \( P_m \) in ‘n’ dimensions which can be represented as

\[ P_m(x_1, x_2, x_3 \ldots x_n) \]

for points of an object ‘O’ in ‘n’ dimensions where \( m \) is number of points =1, 2, …m

Hypothesis 5: If we keep any 3 co-ordinate axes of the ‘n’ axes constant and we attempt to map the remaining ‘n-3’ co-ordinate axes of all the points on the 3 co-ordinate axes.

e.g. Let us say that dimension 1, 2 and 3 are constant (let them be called as x, y and z axes respectively) and all points \( P_m \) are mapped on the say x-axis, y-axis and z-axis for dimensions 1, 2 and 3. Now if we say for dimension 4 for all points \( P_m \) we cluster the dimension 4 such that the Standard Deviation in the clusters or groups tends to be zero, let us say we obtain \( k_4 \) clusters. Similarly for dimension 5, 6… n-3 dimensions we could obtain \( k_5, k_6 \) and \( k(n-3) \) clusters. Now using Hypothesis 1, 2, 3, 4 (given in our earlier paper Reference 7) we could possibly map \( k_4, k_5, k_6 \ldots k(n-3) \) clusters onto x, y and z co-ordinates provided we can satisfy the preconditions in Hypothesis 1, 2, 3, 4 (given in our earlier paper Reference 7).

N.B. The decision as to which 3 co-ordinate axes to be kept constant could be determined by computer simulation of all \( ^nC_3 \) or \(^nP_3\) permutations/combinations and above Hypothesis/Theory applied to these permutations/combinations with suitable clustering to obtain the best fit.

Hypothesis 6: Again, if we keep any 3 co-ordinate axes of the ‘n’ axes constant and we attempt to map the remaining ‘n-3’ co-ordinate axes of all the points on the remaining 3 co-ordinate axes as follows.

e.g. Let us say that dimension 1, 2 and 3 are constant (let them be called as x, y and z axes respectively) and all points \( P_m \) are mapped on the say x-axis, y-axis and z-axis for dimensions 1, 2 and 3. Now if we say for the remaining ‘n-3’ dimensions for every point \( P_m \), let us substitute dimension 4 in place of dimension 1’, similarly dimension 5 for dimension 2’ and so on for all points \( P_m \). Now if we cluster all the dimensions 1’, 2’, 3’ for all points \( P_m \) and obtain say \( k_1, k_2, k_3 \ldots km \) clusters/groups, then again using Hypothesis 1, 2, 3, 4 (given in our earlier paper Reference 7) we could possibly map \( k_1, k_2, k_3 \ldots km \) clusters onto x, y and z co-ordinates provided we can satisfy the preconditions in Hypothesis 1, 2, 3, 4 (given in our earlier paper Reference 7).
N.B. The decision as to which 3 co-ordinate axes to be kept constant could be determined by computer simulation of all \(^6\)C\(_3\) or \(^3\)P\(_3\) permutations/combinations and above Hypothesis/Theory applied to these permutations/combinations with suitable clustering to obtain the best fit.

Hypothesis 7: Now if we cluster all the ‘n’ dimensions 1, 2, 3… n for all points \(P_m\) and obtain say k clusters/groups, then again using Hypothesis 1, 2, 3, 4 (given in our earlier paper Reference 7) we could again possibly map k clusters onto some Hypothetical x, y and z co-ordinates provided we can satisfy the preconditions in Hypothesis 1, 2, 3, 4 (given in our earlier paper Reference 7).

Hypothesis 8: Let us take all \(^6\)C\(_3\) or \(^3\)P\(_3\) permutations/combinations of all the dimensions ‘n’ of a point \(P_1\); similarly for point \(P_2\) and so on for points \(P_3, P_4, ..., P_m\).

Superimpose all points for the first permutation/combination for all the points \(P_m\), similarly for the second permutation/combination for all the points \(P_m\), similarly for the third permutation/combination and so and so forth vertically. For each of the permutation/combination we will get a Hypothetical x, y and z axes (which contains the superposition of all points/co-ordinates in that permutation / combination) resulting in one x-y-z axes for that permutation/combination vertically. Now again superimpose each of these “vertical” x-y-z axes “horizontally”, if the Standard Deviation among these Hypothetical x-y-z axes for each permutation/combination tends to be zero we could assume that the superimposition results in a monotonous shape/object or figure and we could again assume that the n dimensional object/shape is “real” or steady in all n dimensions else we conclude that the ‘n’ dimensional object is non-monotonous or “virtual”.

Hypothesis 9: Again, let us take all \(^6\)C\(_3\) or \(^3\)P\(_3\) permutations/combinations of all the dimensions n of a point \(P_1\); similarly for point \(P_2\) and so on for points \(P_3, P_4, ..., P_m\).

Superimpose all the permutations/combinations for all the co-ordinates of points \(P_1\) into a one single x-y-z co-ordinate, similarly for all the permutations/combinations for the points \(P_2\) into one single x-y-z axis, similarly for \(P_3\) and so on and so forth till \(P_m\) horizontally. For each of the x-y-z axis obtained horizontally now combine them vertically. The resultant x-y-z axes (which contains the horizontal superposition of all points/co-ordinates for all permutations / combination and then combined vertically) are resulting in one x-y-z axes and if the Standard Deviation among these Horizontal Hypothetical x-y-z axes for all permutations/combinations tends to be zero we could assume that the superimposition results in a monotonous shape/object or figure and we could again assume that the n dimensional object/shape is “real” or steady in all n dimensions else we conclude that the ‘n’ dimensional object is non-monotonous or “virtual”.

Hypothesis 10: Let us take all \(^6\)C\(_3\) or \(^3\)P\(_3\) permutations/combinations of all the dimensions n for all the points \(P_m\) and superimpose all points \(P_m\) of the above dimensions for each of the above permutations/combinations which could result in one x-y-z coordinate for all \(^6\)C\(_3\) or \(^3\)P\(_3\) permutations/combinations of all the dimensions ‘n’ for all the points \(P_m\). Let us assume that each superimposition results in a monotonous shape/object or figure (Standard Deviation tends to be zero) for each corresponding permutation/combination, then we could assume that the n dimensional object/shape is “real” or steady in all n dimensions else we conclude that the ‘n’ dimensional object is non-monotonous or “virtual”.

N.B. Implicit in Hypothesis 8, 9 and 10 is the fact that each permutation/combination is shifted to take place of the Hypothetical x-y-z axes. E.g. if the first permutation/combination is 1-2-3 and the next permutation/combinations is 2-3-4 and 3-5-8 then the dimensions are represented as follows 1(x-axis)-2(y-axis)-3(z-axis), 2(x-axis)-3(y-axis)-4(z-axis) and 3(x-axis)-5(y-axis)-8(z-axis); similarly, for all other permutations/combinations to be used in superimpositions.

Also for clustering and superimposition we can potentially use Hypothesis 1, 2, 3 and/or 4 for mapping each permutation/combination onto a Hypothetical x-y-z co-ordinate system different from those represented by the points \(P_m\).
OBSERVATIONS

1. There are two ways of approaching the problem of representing ‘n’ dimensional objects in ‘3’ dimensions – methodologies are-
   - First apply Hypothesis 1, 2, 3, 4 (conversions of points to 3-D) then apply Hypothesis 5, 6, 7, 8, 9 and 10 (map the points using clustering and superimposition).
   - The second approach is first apply Hypothesis 5, 6, 7, 8, 9 and 10 (obtain the relevant points using clustering and superimposition) and then apply Hypothesis 1, 2, 3, 4 (conversions of points clustered / superimposed ‘n’ dimensional points to 3-D)
   - There are other mix and match approaches too – such as first apply vertical clustering then apply conversion from ‘n’ dimensions to 3-D and then again cluster horizontally etc.

2. We have assumed that all points \( P_m \) are ‘n’ dimensional this may not necessarily be the case e.g. point \( P_1 \) may consist of ‘n1’ dimensions, point \( P_2 \) of ‘n’ dimensions and point \( P_3 \) of ‘n3’ dimensions – let us illustrate this using a suitable example.

<table>
<thead>
<tr>
<th></th>
<th>C1</th>
<th>C2</th>
<th>C3</th>
<th>C4</th>
<th>C5</th>
</tr>
</thead>
<tbody>
<tr>
<td>( P_1 )</td>
<td>null</td>
<td>null</td>
<td>null</td>
<td>Value2</td>
<td>null</td>
</tr>
<tr>
<td>( P_2 )</td>
<td>null</td>
<td>Value1</td>
<td>null</td>
<td>Value3</td>
<td>null</td>
</tr>
<tr>
<td>( P_3 )</td>
<td>null</td>
<td>null</td>
<td>Value5</td>
<td>null</td>
<td>null</td>
</tr>
<tr>
<td>( P_4 )</td>
<td>null</td>
<td>null</td>
<td>null</td>
<td>Value6</td>
<td>Value4</td>
</tr>
</tbody>
</table>

Here for points \( P_1 \) n1= 3, for \( P_2 \) n2 = 3, for \( P_3 \) n3 = 2 and for \( P_4 \) n4 = 4

N.B. n4 = 4 and not 5 despite being in column 5 this is because the minimum dimensions start with \( P_2 \), C2.

When the points are of different dimensions n1, n2 etc. it is advisable to apply n1, n2 …n in place of ‘n’ dimensions for above algorithms/hypothesis.

1. Also note that as a result of these Hypothesis/Algorithms (Hypothesis 1 to 10) we may often get disjoint sets or discontinuities e.g. for point \( P_1 \) we may get x4, x6, x9 as convergence or inflection points but x5, x7 and x8 we may not be able to map. In such cases it is advisable to either extrapolate the function used to determine x4, x6, x9 (say e.g. F4, F6, F9 as per Hypothesis 1 etc…) to determine x5, x7 and x8. Also we could use smoothening functions to fill the gaps or discontinuities in space.

2. Also note that several shapes/objects maybe ‘n’ dimensional actually and be visible to our human eyes but we might not realize this on account of our measuring instruments which may/maybe inaccurate in assessing the shape/object which is visible. This may sound like a paradox but it may be true. On the other hand there might be certain 3 dimensional objects which again paradoxically might be invisible on account of the fact that light reflected from such objects are not in the visible spectrum even though the object is 3 dimensional.

3. From above discussions it can be presumed that visibility of an object/shape depends on the number of dimensions of the shape/object (‘n’ dimensions), the points on the object \( (P_m) \) and the light reflected from such an object or the spectrum.

Special Cases:

1. I have visited certain Science Museums where there is what are called as “Laughing Mirrors”, here one can see oblong/elongated/tall/short distorted images of a person. In short the dimension of the person standing in front of the mirror sees distorted images of himself with different dimensions (length, breadth and height).
2. Also people with defective eyes on account of surgery or plain obtaining a number for reading often without the aid of a reading glass/lens sees only blurred images or images which are different (either the images are small or too big or unclear) as compared to those seen by a normal eye. With the aid of a lens/reading glass the person can see shapes/objects/images a little better maybe slightly clearer and with bigger/smaller dimensions (e.g. a solid pyramid or solid cube might appear as a pyramid or cube with the lens but say with smaller/bigger dimensions as compared with those of seen by a normal eye).

3. Also the tests normally used to determine a number of the glass/lens for a defective eye are normally a color test, recognition of special characters/symbols, ability to read text, font size test and test of cylindrical axis for the eye (all these tests are on 2-Dimensional paper or other material). I recommend at the very least there should tests for recognition of 3-D based objects/shapes and standardization of the same. If we are able to design/construct ‘n’ dimensional objects/shapes and conduct tests for determining defective eyes from the normal eyes (a defective eye sees a different image as compared to the normal eye) it would be great.

4. On the basis of points 1,2 and 3 if we are able to design/construct a lens or reading glass for a defective eye(s) such that the lens is able to correct the light and the dimensions entering the eyes, enabling better or more suitable visibility for the visually impaired it would serve the purpose of aiding a defective eye to see better. At the very least there could be a standardization of ‘n’ dimensional objects/shapes/patterns seen by defective and normal eyes which could enable in design/construction of better lens/reading glasses.

5. Also it would be nice if the lens/reading glass designed/constructed changes its properties depending upon the image being viewed as in a camera (with zoom/focus, ability to adjust light, dimensions etc.).

Benefits:

1. The design/construction of the above lens/reading in addition to being a superior quality product would also be cheap (inexpensive), maybe effective (depending upon the standardization achieved), and involve non-invasive methodology (not involve surgery).

2. Similar products could be constructed such as quality Microscopes (for detection of germs/virus/microbes for disease detection/control), Telescopes(for better images of the Universe) in Astrophysics, Nano-technology, better determination and creation of quality Pharmaceutical drugs, Chemicals and other Material substances including but not limited to quality Instruments.

REFERENCES

1. A method to determine co-ordinates of planetary objects/stars and other objects in the sky/space in 3-dimensional Euclidean Space with respect to Centre of the Universe– Mar 2012 Vol. I Issue III


4. Hatim’s Theory with respect to Einstein’s Theory on Speed of Light in Space and with respect to Space-Time Relationships/Anomalies in Space using Euclidean math – March 2013 Vol. II Issue III


6. Sai Om Journal of Science, Engineering & Technology, Online ISSN 2347-7555, Paper titled “N Dimensional Eye”, April 2015