

Review Article

Pasta... Messaging Food and Inner Beauty Together... an Experiment in Cognitive Economics

Attila Gere¹, Kantha Shelke², Batool Batalvi³, Ryan Zemel⁴, Andi Sciacca⁵, Petraq Papajorgji⁶ and Howard Moskowitz⁷

¹Szent István University, Faculty of Food Science, Department of Postharvest Science and Sensory Evaluation, Budapest, Hungary

²Corvus Blue, Inc., Chicago, IL, USA

³SB&B Research, Toronto, Ontario, Canada

⁴Limbic Reviews, Founder, Chicago, IL, USA

⁵Bimi Corp, Division of Mind Genomics Associates, Inc., USA

⁶Universiteti European i Tiranes, Bulevardi "Gjergj Fishta", Tirane, Albania

⁷Mind Genomics Associates, White Plains, New York, USA

*Correspondence Author: Howard Moskowitz, Mind Genomics Advisors, 11 Sherman Ave, White Plains, NY 10605, USA; Tel: 914-572-1673; Email: mjihrm@sprynet.com

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Abstract

We present a new approach to design foods at the conceptual stage. The approach mixes and matches ideas about the food using experimental design, presents these combinations of ideas, and instructs respondents to rate the combinations. The approach forces respondents to make trade-offs among different aspects, but at an almost unconscious level. What emerges is a sense of what specifically is important, as well as the existence of two or more different mind-sets. The approach efficiently screens through ideas at low cost, producing both information for decisions, and archival, intellectual property for ongoing business and scientific efforts.

Introduction

The world of commercial food has evolved from staples to a myriad of assorted flavors of different, common foods, such as pasta sauces, mustards, teas. Indeed, there is a so-called 'paradox of choice' emerging, wherein the consumer is bombarded with so many alternatives of a product, often touted as 'new and different,' that the consumer withdraws to a limited set of alternatives of a product, flavors, textures, i.e., different SKU's (shop-keeping units) in the language of the retail trade. Schwartz, 2004 [1].

Beyond the different flavors lies the whole new world of 'food as medicine.' These are so-called nutraceutical foods, foods which are good-for-you, and good tasting. We are not talking here of supplements which are not foods, but rather foods touted as having some health-benefits. Scarcely a day goes without one or another food being 'discovered' to be good for one or another condition which ails humans. The story changes as well. One day caffeine in coffee is bad. Another day, someone finds that daily cups of coffee are actually good for one's heart [2]

A newly emerging trend is food as a promoter of beauty, so-called 'beauty from within' (Tabor and Blair, 2009.) The ingoing notion is that by eating the right foods, one can become beauty. The beauty can be achieving the proper weight, or having a beautiful skin, and so forth. Beauty from within is an attractive idea, combining as it does the desire to eat 'well' and to 'look well,' certainly a powerful combination.

A lot of the work on 'good for-you-foods' is reported in newsletters, from stories released for the public by companies. The expectation is that these stories somehow will be 'picked up,' and enter the minds of the public, not so much as an isolated factoid whose origin is well known, but rather as something which will seep into one's mind to become simply a 'fact' of the world, the way 'things are.' There are papers in refereed scientific journals, but the scientific community and certainly the world of reputable scientific publications has no fighting chance against the tidal wave of food claims, especially food claims which are technically 'legal,' at least on the surface, and do not seem to have anything to do with so-called 'fake news,' even 'fake nutrition news.'

The contribution of Mind Genomics and Cognitive Economics to understanding the nutraceutical aspects of pasta

From the above-mentioned discussion of the food in the light of claims, it makes eminent sense to study how PEOPLE respond to what is claimed. Do the claims convince? Are they Believable? Will people pay for these claims? Our focus is pasta, a very popular food, eaten around the world in different forms, a long-term staple, and a food that can be modified in many ways to appeal to consumers, whether in terms of taste, health, versatility, and so forth. Just think, about the popularity of mac n cheese among children, and at the same time the pastas served at high end restaurant. It should be no surprise that in Google Scholar®, there are 33,000+ citations for pasta and consumer benefits. [3,4]

By presenting the issue of nutraceutical claims in terms of belief and dollar value, we move out of the world of nutrition and food science, and into the world of consumer research. Our focus is not on what is true 'scientifically,' but rather what is believed to be true. Can we discover what is believed to be true, and move out from that to understand, possibly, what about the message itself might drive this belief? While we are doing so, we might even discover different groups of people, different 'Mind-Sets,' or ways of looking at the same messages, so one Mind-Set might believe certain types of messages, and not others, whereas a second-mind set might believe different messages. The same might hold for the dollar value of these messages.

The science to help us address these issues of belief and monetary value is a newly-emerging field of consumer science and psychology known as Mind Genomics. The premise of Mind Genomics is that for every topic of experience where judgment is called for, e.g., belief in claims, there are a small number of groups of ideas which move together. There may be one, two, three, four, or perhaps even five or more of these groups of ideas, known as Mind-Sets. The Mind-Set can be likened, metaphorically, the three basic colors, red, yellow, and blue. At any one time a person is presumed to hold one Mind-Set, one mental genome, one set of primary ideas for a topic area [5,6].

In contrast to color primaries and physical genes, Mind-Sets are constructed on an *ad hoc* basis, looking at the pattern of responses to a set of related ideas, these ideas in our case dealing with the nutritional and health aspects of pasta. The Mind-Sets emerge from a statistical process, clustering, so that people showing the same pattern of responses to a set of elements are presumed to hold the same Mind-Set.

Moving beyond Mind Genomics we have the topic of perceived subjective value. What is the respondent will to pay for these features and benefits of a pasta which is 'good for you?' Will the respondent simply pay more for the pasta she or he likes? Or does *homo economicus*, economic man, the part of our mind dealing with price, somehow obey different rules?

When we introduce economics, price, we introduce a new factor, a new consideration. We are asking the respondent to tell us what something is worth, a more rational decision than simply do you like what you read. In previous studies by author HRM it continued to emerge that *homo economicus* was more conservative than *homo emotionalis*, the evaluation of liking.

We explore the subjective value by a newly emerging tool from the world of behavioral economics. Rather than asking the respondent how much she or he would pay for the product, we present the product as an offering from a company and ask how many shares of the company the respondent feels that he would purchase, based upon what was just presented in the test vignette (Mind Genomics terms for the test concept.) The approach is called predictive markets. In many applications, the respondent is given actual money to invest. In our study, predictive markets are simply another way of assigning a dollar value to the business proposition described by the vignette.

Approach

Mind Genomics proceeds in a systematic fashion to understand the way people make decisions. The process, explained in expanded form below, mixes ideas, presents these mixtures as vignettes, obtains

responses to the vignettes, and deconstructs the responses to the part-worth contribution of each idea. The result reveals the internal weights used by the respondent to make judgments, whether these be judgments of believability or judgments of price willing to pay.

1. The raw materials. The first step acquires the raw materials, the specific messages. The messages are categorized into silos. Table 1 shows the set of six silos, each silo having six elements (messages). We have edited the names of the silos so that they are questions. This editing is done for didactic reasons, to make the process more Socratic, more tutorial. By asking questions and giving answers, the user begins to think in a more structured fashion, making further studies easier when one uses Mind Genomics as the investigatory tool.

The elements were generated according to author Batalvi's approach, called the 5-Keys (Batalvi, Personal Communication, 2011.) The 5-key method, used in Batalvi's psychotherapy work, allows the therapist to understand the way a therapy client 'thinks' about a certain problem. It was Batalvi's suggestion to use 5-Keys as an organizing principle to identify the key dimensions for a product experience.

The Test Vignettes

Mind Genomics works by combining the elements (Table 1) into short, easy-to-read combinations called test vignettes. Figure 1A presents one of the vignettes, showing the combination, and the rating scale at the bottom. The rating scale, discussed below, deals with believability Figure 1B shows the same vignette, i.e., the exact same combination, but with the second question, on amount willing to pay, expressed as shares that one would invest.

The vignette presents the respondent with a set of different elements, selected from the set of elements in Table 1. The elements are presented as centered, with no effort made to connect the phrases. The ingoing approach of Mind Genomics is that the respondent searches through the vignette to find the relevant information to make their judgment, the nature of that judgment defined by the rating scale.

Underneath the vignettes lies an experimental design, a specific 'menu' of combinations. For this study the experimental design is known, in Mind Genomics terms, as '6 × 6', meaning 6 silos (questions) × 6 element/silo (answers), i.e., 36 input elements. These 36 elements are combined into short, easy-to-read vignettes. The 6x6 design specifies a precise set of 48 vignettes, 36 vignettes comprising four elements, and 12 vignettes comprising three elements. No more than one element may appear from any silo, but with the maximum of four elements per vignette, and the minimum of three elements per vignette, there are two or three silos absent from each vignette.

Traditional experimental designs specify one specific set of combinations, with each respondent testing either all the vignettes or a specific subset of vignettes. In the traditional research paradigm, the replication of the same stimuli across respondents is done in order to obtain judgments from different types of judges (respondent), and in the end to reduce the magnitude of the sampling error around the rating of each vignette. Mind Genomics travels in a different direction. *Each respondent tests a different set of combinations, but all the combinations or vignettes tested by a single respondent suffice to create*

a model or equation for that respondent, the model created relating the presence/absence of the 36 elements to the ratings. This strategy permutes the combinations but keeps the experimental design intact. All that that happens is that the specific combinations change. The basic structure

does not change. By so doing, Mind Genomics acts metaphorically like the MRI machine, taking 'different slices' of the possible set of combinations of elements. Each slice is complete within itself, but the set of different slices gives a very good sense of the underlying structure [7].

Table 1. The silos and the elements

Silo A: How are GOOD CARBS Food for 'Brain, Brawn or Beauty'?	
A1	Eating the right kinds of carbohydrates is your secret to losing weight... choose 'Good Carbs' pasta to stay slim
A2	Good Carbs pasta lowers cholesterol levels, helps to remove toxins from the body...bringing out your inner beauty
A3	Increase your energy, naturally and dramatically by selecting the wholesome, 'Good Carbs' our bodies were designed to eat
A4	Greater thermic effect in good carbs pasta, naturally stimulates metabolism and promotes fat loss...so you are always quick on your feet
A5	Make a BIG difference to your mental faculties with regular intake of Good Carbs pasta...your companion in higher order thinking
A6	High in fiber good carbs pasta helps you stay full longer and avoid overeating...so your mind stays focused and razor sharp
Silo B: What does GOOD CARBS have in terms of vitamins and minerals?	
B1	Iron, when consumed in the diet, builds concentration among students and professionals...another reason to choose Fortified Pasta
B2	Since oxygen supply to blood is aided by iron, incorporate fortified pasta into your eating plans... get more 'smarts' out of your food
B3	Would you like to have radiant looking skin? Fortified Pasta takes multigrain to a whole new level... giving you many vitamins & minerals... for that flattering look
B4	Only one cup of enriched fortified pasta is a good source of nutrients... iron and several B-vitamins...so you look your BEST
B5	Enriched pasta is fortified with folic acid – essential to your muscle health
B6	Iron deficiency is a natural cause of fatigue... Fortified Pasta keeps your hemoglobin and energy levels high
Silo C: Describe Your Feelings (Associated Moods, Emotions) after eating Good Carbs	
C1	A healthy 'Good Carbs' pasta serving...your favorite comfort food... for a dose of optimism
C2	A filling Good Carbs pasta meal makes you calm and reduces stress
C3	Relax...put away your fear of carbs... by choosing Good Carbs Pasta!
C4	Put some pep in your step: feel confident with the extra energy boost from Fortified Pasta!
C5	Eat your serving of Fortified Pasta...find yourself smiling through the day
C6	Feeling dull? Losing concentration by mid-day? Fortified Pasta nutrients... will help you regain focus
Silo D: How do you purchase these products?	
D1	Get the most out of your dollar: buy Fortified pasta, an affordable goodness!
D2	Get quality & value: purchase Fortified pasta - your sensible choice
D3	Fortified pasta... goodness in a pack...worth the extra money
D4	Try our Pasta trio... with Good Carbs pasta + sauce + seasoning: 3-in-one pack
D5	Love to stock-up on Good Carbs pasta deals...such as weekly specials and coupons
D6	Look out for the unique Quality Assurance mark ... on Good Carbs Pasta packaging
Silo E: What are the sensates and physiological reactions to these products?	
E1	Enjoy the rich and artisanal taste of Good carbs pasta
E2	Amplified flavors of Good Carbs pasta... deeper and more vibrant on the tongue
E3	Good Carbs pasta, slow dried at low temperatures... so as not to eradicate molecular structure... preserving flavors and aroma
E4	Inviting appearance of Fortified pasta with visible ridges...allowing each strand to hug the sauce
E5	Smooth and glazed look of Fortified pasta... appetizing...for the entire family
E6	Mild taste and texture of Fortified Pasta ... with that little hint of an earthy/ wheaty tone
Silo F: What is the personality of the eater (Profiling Type Extraverts vs Introverts)/	
F1	Pretty convincing... for a confirmed carb skeptic
F2	Not particularly convincing... for a confirmed carb skeptic
F3	Love social interactions? Tend to be enthusiastic, verbal, and assertive? Fortified pasta boosts YOUR sociability!
F4	Like interacting with people and offering your opinions freely? Fortified pasta keeps YOU going!
F5	Prefer activities that you can do alone or with a close friend, such as reading, reflecting? Good Carbs pasta ... a positive effect on YOUR mood!
F6	Find social gatherings draining after some time? Good Carbs pasta reduces daily stress & irritability

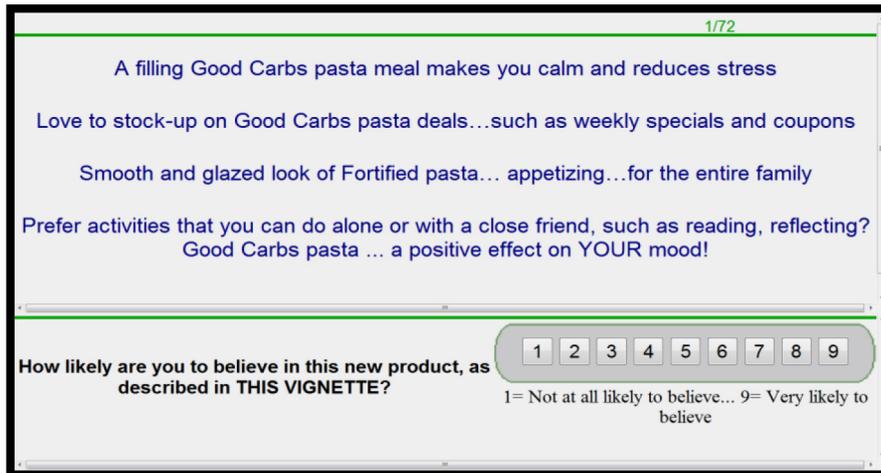


Figure 1A. A vignette showing four elements, with the first rating scale, believability.

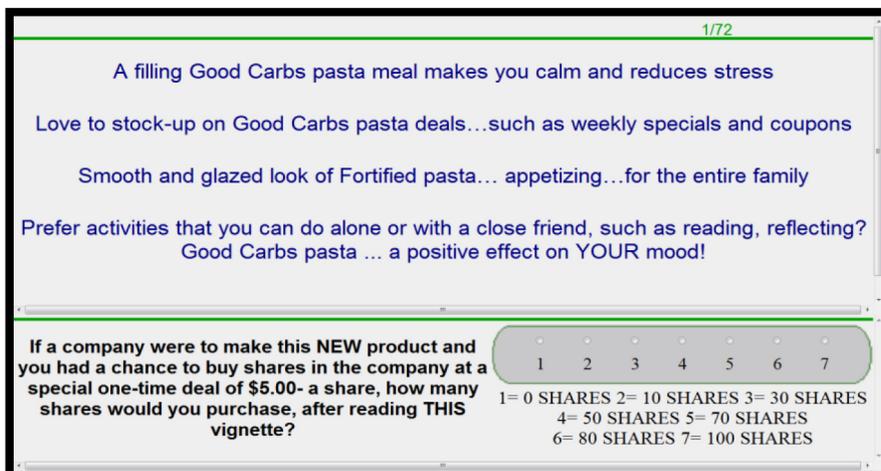


Figure 1B. The same vignette showing the four elements, with the second rating scale, "shares" of stock that one would purchase.

The Respondent Experience

The respondents were invited by a company (Amazon's Mechanical Turk, [8]). The respondents had previously volunteered to participate in these studies and were compensated by the panel organizer. The study did not specify any qualifications.

The fielding proceeds in a standardized fashion, appropriate for the second decade of the 21st Century. At the start of the 21st Century one could invite thousands of respondents to participate in these studies and be reassured of a reasonable participation rate around 15% - 25%. One could increase the response rate dramatically by offering some incentive, such as points towards purchasing a gift card, and so forth. The study here was run in 2013, when the respondents were recruited to participate with the help of the e-panel provider. The panel provider mailed out invitations to qualified respondents, which in this study comprised individuals aged 18+. With three days the study garnered 142 respondents, and was 'closed,' with the data analyzed.

The Orientation Page

Respondents who agreed to participate clicked a link embedded in their email invitation. The respondents were told that the study

was about pasta, but nothing more, until they agreed to participate. Those respondents who agreed to participate were presented with the orientation page (Figure 2). The orientation page tells the respondent about the topic of the experiment but does not provide much specific information. Most of the orientation is devoted to what the respondent must do, in terms of test mechanics. It is up to the elements to drive the actual rating, which is why we spend little time telling the respondent much about the product. That information, what the product it, what it does, and so forth, is what we want to present, and whose impact we want to measure.

It is important to tell the respondent what they should provide (their 'gut' or 'instinctive' response to the vignette.) Often the respondent tries to be overly analytical. The text usually works well, disabusing the respondent from striving to be 'correct,' and reduces the tendency to give answers that the respondent thinks would be 'socially appropriate'

The respondent read the orientation page (Figure 2) and evaluated 48 vignettes constructed in the format of Figures 1A and Figure 1B, respectively. Each vignette was rated on two questions. At the end of the evaluation section, the respondent completed an extensive

questionnaire about WHO the respondent is, what the respondent DOES, and what the respondent BELIEVES. This self-profiling classification provides a rich source of additional data about the

respondent, and will be used to complement the data uncovered about Mind-Set segments

Hello! May we borrow 13 minutes to read your mind? Your thoughts about a new pasta product idea will be explored in this survey.
Please react to each vignette in its entirety - as it appears on your screen and use the rating scale at the bottom of each screen to answer.

At the end of the concept section, please help us learn about you a bit by answering just a few questions for classification purposes...It's all confidential... we don't know who you are, but we'd like to find out your opinions and how you feel about pasta!

Please Click >> to begin...and don't ignore some vignettes, just because they seem a bit repetitive.
They're not!
Enjoy the ride!!!
(Tip: Your gut reaction will be the most honest 😊)

Figure 2. The orientation screen, introducing the study.

Results

Do those respondents who tend to 'believe' also say that they will invest more?

Each respondent evaluated 48 vignettes on believability and on price, respectively. Is there any relation between the two? We expect that when the respondents feel that the vignette is not believable, that they would not invest. In contrast, we should not expect any relation at all between high believability and willingness to invest. Our analysis will look at each respondent as a single point, with an average rating of believable across all of the 48 vignettes, and a corresponding rating of the number of shares one would purchase. Our analysis is thus 'cross-sectional,' looking at the pattern created by the ratings of different people, rather than at the pattern generated by one person across different stimuli.

Figure 3 shows a remarkable pattern. Each filled circle in Figure 3 corresponds to the average ratings of one of the 142 respondents across 48 vignettes. We can conclude from Figure 3 that those few respondents who strongly believe what they read will invest more. These are respondents whose average rating on 'believe' is 7.0 or higher. For the remaining respondents, showing lower average ratings of 'believe' across the 48 vignettes, there is a general but noisy pattern suggesting that those who believe what they read will tend to invest somewhat more. The pattern is much more diffuse when we deal with those who are skeptical. Finally, there are respondents who will invest absolutely nothing, whether or not they believe what they read. These are the respondents with the lowest average ratings of number of shares. Whether they believe or not makes no difference.

What elements drive believability and investment, respectively for the pasta

The focus of Mind Genomics is the relation between the elements in the vignette, our messages about pasta, and the ratings assigned

by the respondents, here believability and shares one would purchase as an investment in the product. The vignettes themselves are simply the matrix in which the messages are embedded, presenting to the respondent a reasonable offer.

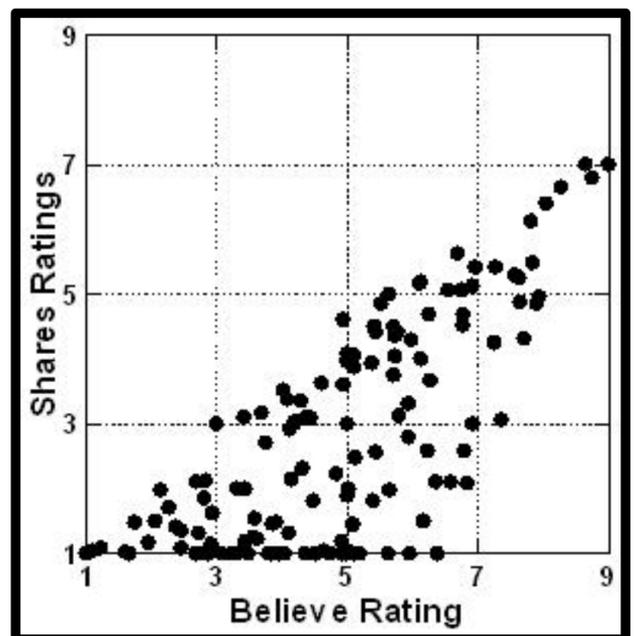


Figure 3. Relation between the average rating of believability (abscissa) and the average rating of amount that one would invest.

Our first effort to understand the contribution of the individual elements is to revisit the scales and transform them to measures that can be easily understood by managers. That transformation will make the analysis much easier, and the results more compelling.

Although respondents can easily rate the vignettes on a 9-point scale, the manager presented with the information does not

know what to do with the different scale points, and indeed does not really understand the scale points. One could spend what could end up being a lot of time assigning a label to each scale point, in order to facilitate the manager's interpretation of the data. An easier way to make the result more understandable and 'user-friendly' turns the scale into a binary scale. Ratings of 1-6 become '0' to denote little or no believability in the vignette. Ratings of 7-9 become '100' to denote a lot of believability in the vignette. The subsequent analysis will be much easier to interpret.

After the ratings for believability are transformed to their binary equivalents, we add a small random number ($<10^{-5}$) to each one. The number does not affect the results but becomes very important when we build individual-level models later on when we deal with Mind-Set segmentation.

Deconstructing the response to the contribution of the individual elements

The easiest way to understand the results comes from deconstructing the overall binary rating (plus random number) to the contributions of the 36 individual messages, the elements in Table 1. The respondent usually is unable to explain to the research how the decision was made for any particular vignette, even though it appeared fairly easy to do. Despite the seeming elusive nature of one's decision processes, at least the fact that one does not know them, the results make sense when regression analysis is used to relate the presence/absence of the elements to the binary (post-transformation) ratings.

Table 2 shows the linear model relating the presence/absence of the 36 elements to the rating of believability. The model incorporates the data of all of the 142 respondents, with each of the 48 vignettes corresponding to a single case.

1. The additive constant estimates the conditional probability of a study participant saying 'I believe what I read' (rating 7-9 on the first scale), in the absence of elements. Of course, the experimental design ensured that each vignette comprised a minimum of three elements, and a maximum of four elements. Thus, the additive constant is a purely estimated parameter, similar to the additive constant in the age-income relation, where it is the income at age '0'. The additive constant is 23.37, suggesting that almost a quarter of the responses will 'believe,' even in the absence of elements.
2. The t-statistic tells us the ratio of the coefficient to the standard error of estimate. The higher the t statistic, the greater is the strength of the signal, or in our case, the more that we can believe that our value of 23.27 really differs from 0.
3. The p-value, associated with the t-statistic, gives us the probability that the t value comes from a sampling distribution whose mean is actually 0. We want to make the p-value as low as possible. A high p value means that it is likely that the t-statistic comes from a distribution whose true mean is 0. When we see a high p-value, we typically conclude that the 'real value' of the coefficient is probably 0.
4. Table 2 shows the coefficients in rank order, from high to low. It is always more interesting to see what is a true signal, what is likely to

be a real 'effect' than something which looks real, but statistically is likely to be 0.

5. We set a criterion, above which we will not go. For the purposes of this paper, let us set the criterion as a p-value of +0.10. We will focus on those elements whose coefficients are sufficiently high in a positive direction, so that their p-value is lower than 0.10.
6. Here are the five strongest elements for believability, i.e., the elements which end up driving believability when they are incorporated into a vignette. In other words, these elements are those that are believed. We don't know how attractive they are to the consumer, but they are certainly believed to be true.

High in fiber good carbs pasta helps you stay full longer and avoid overeating...so your mind stays focused and razor sharp

Increase your energy, naturally and dramatically by selecting the wholesome, 'Good Carbs' our bodies were designed to eat

Eating the right kinds of carbohydrates is your secret to losing weight... choose 'Good Carbs' pasta to stay slim

Try our Pasta trio... with Good Carbs pasta + sauce + seasoning: 3-in-one pack

Get the most out of your dollar: buy Fortified pasta, an affordable goodness!

We now turn to the second rating scale, shares. This time we simply transform the dependent variable, the original 9-point scale, to the number of shares corresponding to each scale point. Again, we add a very small random number to ensure that the regression does not fail. This will become important when we create individual-level models in preparation for uncovering Mind-Sets.

The traditional analyses of responses couched in terms of money fits a regression model without an additive constant. The rationale is that in the absence of information about the offer (viz., in the absence of elements in the vignette) one does not invest, and therefore the expected rating is 0. The reality is that it makes little difference whether we estimate the model with an additive constant or without an additive constant. The coefficients are different, but they are almost perfectly correlated (see Figure 4).

When we look at the elements which generate the highest share value (those with p-values less than 0.10), we find five very elements commanding the high price (see Table 3.)

Eating the right kinds of carbohydrates is your secret to losing weight. Choose 'Good Carbs' pasta to stay slim

Try our Pasta trio. with Good Carbs pasta + sauce + seasoning: 3-in-one pack

Good Carbs pasta lowers cholesterol levels, helps to remove toxins from the body...bringing out your inner beauty

Increase your energy, naturally and dramatically by selecting the wholesome, 'Good Carbs' our bodies were designed to eat

High in fiber good carbs pasta helps you stay full longer and avoid overeating.so your mind stays focused and razor sharp

Table 2. The performance of the elements on rating scale #1, believability, after the binary transformation.

		Coeff	t Stat	p-value
	Additive Constant	23.37	5.05	0.00
A6	High in fiber good carbs pasta helps you stay full longer and avoid overeating...so your mind stays focused and razor sharp	6.90	3.20	0.00
A3	Increase your energy, naturally and dramatically by selecting the wholesome, 'Good Carbs' our bodies were designed to eat	4.86	2.22	0.03
A1	Eating the right kinds of carbohydrates is your secret to losing weight... choose 'Good Carbs' pasta to stay slim	4.69	2.18	0.03
D4	Try our Pasta trio... with Good Carbs pasta + sauce + seasoning: 3-in-one pack	4.37	2.03	0.04
D1	Get the most out of your dollar: buy Fortified pasta, an affordable goodness!	3.60	1.70	0.09
B6	Iron deficiency is a natural cause of fatigue... Fortified Pasta keeps your hemoglobin and energy levels high	2.83	1.32	0.19
C3	Relax...put away your fear of carbs... by choosing Good Carbs Pasta!	2.24	1.04	0.30
B5	Enriched pasta is fortified with folic acid – essential to your muscle health	1.86	0.87	0.39
A2	Good Carbs pasta lowers cholesterol levels, helps to remove toxins from the body...bringing out your inner beauty	1.84	0.85	0.40
A4	Greater thermic effect in good carbs pasta, naturally stimulates metabolism and promotes fat loss...so you are always quick on your feet	1.76	0.81	0.42
C2	A filling Good Carbs pasta meal makes you calm and reduces stress	1.59	0.74	0.46
D5	Love to stock-up on Good Carbs pasta deals...such as weekly specials and coupons	1.55	0.73	0.47
B4	Only one cup of enriched fortified pasta is a good source of nutrients... iron and several B-vitamins...so you look your BEST	1.51	0.71	0.48
E5	Smooth and glazed look of Fortified pasta... appetizing...for the entire family	1.25	0.59	0.55
E6	Mild taste and texture of Fortified Pasta ... with that little hint of an earthy/ wheaty tone	1.10	0.52	0.60
C4	Put some pep in your step: feel confident with the extra energy boost from Fortified Pasta!	0.99	0.47	0.64
B1	Iron, when consumed in the diet, builds concentration among students and professionals...another reason to choose Fortified Pasta	0.97	0.45	0.65
D6	Look out for the unique Quality Assurance mark ... on Good Carbs Pasta packaging	0.92	0.43	0.67
E4	Inviting appearance of Fortified pasta with visible ridges...allowing each strand to hug the sauce	0.86	0.41	0.68
D3	Fortified pasta... goodness in a pack...worth the extra money	0.84	0.40	0.69
E1	Enjoy the rich and artisanal taste of Good carbs pasta	0.36	0.17	0.87
E3	Good Carbs pasta, slow dried at low temperatures... so as not to eradicate molecular structure... preserving flavors and aroma	0.24	0.11	0.91
D2	Get quality & value: purchase Fortified pasta - your sensible choice	0.21	0.10	0.92
B2	Since oxygen supply to blood is aided by iron, incorporate fortified pasta into your eating plans... get more 'smarts' out of your food	-0.09	-0.04	0.97
A5	Make a BIG difference to your mental faculties with regular intake of Good Carbs pasta...your companion in higher order thinking	-0.49	-0.23	0.82
E2	Amplified flavors of Good Carbs pasta... deeper and more vibrant on the tongue	-0.86	-0.41	0.68
C6	Feeling dull? Losing concentration by mid-day? Fortified Pasta nutrients... will help you regain focus	-0.91	-0.43	0.67
F1	Pretty convincing.... for a confirmed carb skeptic	-1.00	-0.46	0.65
B3	Would you like to have radiant looking skin? Fortified Pasta takes multigrain to a whole new level... giving you many vitamins & minerals... for that flattering look	-1.06	-0.50	0.62
C1	A healthy 'Good Carbs' pasta serving...your favorite comfort food... for a dose of optimism	-1.36	-0.64	0.52
C5	Eat your serving of Fortified Pasta...find yourself smiling through the day	-1.47	-0.69	0.49
F5	Prefer activities that you can do alone or with a close friend, such as reading, reflecting? Good Carbs pasta ... a positive effect on YOUR mood!	-2.39	-1.10	0.27
F4	Like interacting with people and offering your opinions freely? Fortified pasta keeps YOU going!	-3.07	-1.41	0.16
F6	Find social gatherings draining after some time? Good Carbs pasta reduces daily stress & irritability	-3.73	-1.72	0.09
F3	Love social interactions? Tend to be enthusiastic, verbal, and assertive? Fortified pasta boosts YOUR sociability!	-5.77	-2.66	0.01
F2	Not particularly convincing... for a confirmed carb skeptic	-6.03	-2.75	0.01

Table 3. Models for shares, showing the parameters of the models when the model is estimated with an additive constant (left set of parameters), and when the model is estimated for the same data, but without an additive constant (right set of parameters.)

		Coeff	t-stat	p-val	Coeff	t-stat	p-val
	Additive constant	27.19	8.01	0.00	NA	NA	NA
A1	Eating the right kinds of carbohydrates is your secret to losing weight. Choose 'Good Carbs' pasta to stay slim	3.54	2.25	0.03	10.79	8.33	0.00
D4	Try our Pasta trio. with Good Carbs pasta + sauce + seasoning: 3-in-one pack	2.75	1.75	0.08	10.01	7.73	0.00
A2	Good Carbs pasta lowers cholesterol levels, helps to remove toxins from the body... bringing out your inner beauty	2.62	1.66	0.10	9.98	7.70	0.00
A3	Increase your energy, naturally and dramatically by selecting the wholesome, 'Good Carbs' our bodies were designed to eat	2.61	1.62	0.11	10.28	7.93	0.00
A6	High in fiber good carbs pasta helps you stay full longer and avoid overeating.so your mind stays focused and razor sharp	2.53	1.60	0.11	9.91	7.66	0.00
A4	Greater thermic effect in good carbs pasta, naturally stimulates metabolism and promotes fat loss.so you are always quick on your feet	2.05	1.29	0.20	9.40	7.26	0.00
B4	Only one cup of enriched fortified pasta is a good source of nutrients. iron and several B-vitamins.so you look your BEST	1.53	0.98	0.33	8.68	6.69	0.00
B1	Iron, when consumed in the diet, builds concentration among students and professionals...another reason to choose Fortified Pasta	1.51	0.96	0.34	8.67	6.68	0.00
B6	Iron deficiency is a natural cause of fatigue. Fortified Pasta keeps your hemoglobin and energy levels high	1.47	0.93	0.35	8.73	6.75	0.00
C4	Put some pep in your step: feel confident with the extra energy boost from Fortified Pasta!	1.37	0.88	0.38	8.27	6.36	0.00
C2	A filling Good Carbs pasta meal makes you calm and reduces stress	1.34	0.86	0.39	8.45	6.50	0.00
C3	Relax...put away your fear of carbs. by choosing Good Carbs Pasta!	1.28	0.81	0.42	8.58	6.61	0.00
D5	Love to stock-up on Good Carbs pasta deals...such as weekly specials and coupons	1.27	0.81	0.42	8.30	6.39	0.00
E4	Inviting appearance of Fortified pasta .. with visible ridges...allowing each strand to hug the sauce	1.18	0.76	0.45	8.01	6.16	0.00
D3	Fortified pasta. goodness in a pack...worth the extra money	1.01	0.65	0.52	8.01	6.16	0.00
B3	Would you like to have radiant looking skin? Fortified Pasta takes multigrain to a whole new level. giving you many vitamins & minerals. for that flattering look	0.98	0.62	0.53	8.05	6.19	0.00
E6	Mild taste and texture of Fortified Pasta. with that little hint of an earthy/wheaty tone	0.92	0.59	0.55	7.64	5.87	0.00
D1	Get the most out of your dollar: buy Fortified pasta, an affordable goodness!	0.90	0.58	0.56	7.85	6.05	0.00
B5	Enriched pasta is fortified with folic acid - essential to your muscle health	0.85	0.54	0.59	8.04	6.18	0.00
C6	Feeling dull? Losing concentration by mid-day? Fortified Pasta nutrients. will help you regain focus	0.56	0.36	0.72	7.45	5.74	0.00
D6	Look out for the unique Quality Assurance mark ... on Good Carbs Pasta packaging	0.54	0.35	0.73	7.71	5.94	0.00
B2	Since oxygen supply to blood is aided by iron, incorporate fortified pasta into your eating plans. get more 'smarts' out of your food	0.40	0.26	0.80	7.70	5.94	0.00
E3	Good Carbs pasta, slow dried at low temperatures. so as not to eradicate molecular structure. preserving flavors and aroma	0.15	0.10	0.92	6.67	5.12	0.00
D2	Get quality & value: purchase Fortified pasta - your sensible choice	0.05	0.03	0.97	6.89	5.30	0.00
E1	Enjoy the rich and artisanal taste of Good carbs pasta	0.04	0.02	0.98	6.77	5.19	0.00
C1	A healthy 'Good Carbs' pasta serving...your favorite comfort food. for a dose of optimism	-0.14	-0.09	0.93	6.90	5.31	0.00
E5	Smooth and glazed look of Fortified pasta. Appetizing...for the entire family	-0.25	-0.16	0.87	6.36	4.87	0.00
F1	Pretty convincing.... for a confirmed carb skeptic	-0.26	-0.16	0.87	7.31	5.66	0.00

		Coeff	t-stat	p-val	Coeff	t-stat	p-val
A5	Make a BIG difference to your mental faculties with regular intake of Good Carbs pasta... your companion in higher order thinking	-0.27	-0.17	0.87	7.28	5.63	0.00
C5	Eat your serving of Fortified Pasta...find yourself smiling through the day	-0.33	-0.21	0.84	6.76	5.21	0.00
E2	Amplified flavors of Good Carbs pasta. deeper and more vibrant on the tongue	-0.68	-0.44	0.66	6.06	4.65	0.00
F4	Like interacting with people and offering your opinions freely? Fortified pasta keeps YOU going!	-0.76	-0.48	0.63	6.78	5.24	0.00
F5	Prefer activities that you can do alone or with a close friend, such as reading, reflecting? Good Carbs pasta ... a positive effect on YOUR mood!	-1.26	-0.80	0.43	6.19	4.78	0.00
F6	Find social gatherings draining after some time? Good Carbs pasta reduces daily stress & irritability	-1.44	-0.91	0.36	5.98	4.62	0.00
F2	Not particularly convincing... for a confirmed carb skeptic	-2.29	-1.43	0.15	5.42	4.20	0.00
F3	Love social interactions? Tend to be enthusiastic, verbal, and assertive? Fortified pasta boosts YOUR sociability!	-3.27	-2.05	0.04	4.23	3.27	0.00

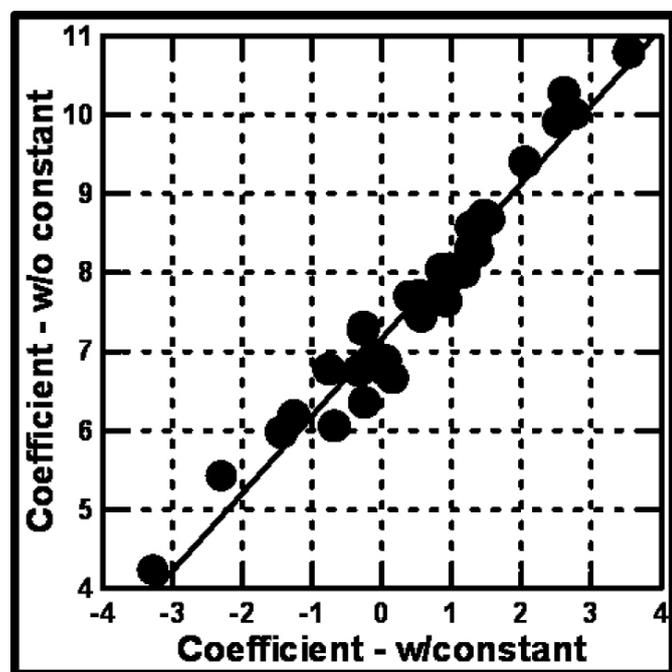


Figure 4. The coefficients for the 36 elements, estimated with the model having an additive constant (abscissa) and without an additive constant (ordinate).

The strongest messages, commanding the highest prices, address dramatically different needs and uses, ranging from weight loss, ease of preparation, to body health and energy. It may well turn out that there are dramatically different Mind-Sets when we dive more deeply into the results.

Will respondents pay more for what they believe to be true?

What happens when we plot the coefficients for shares (model without additive constant) against the coefficients for believability. Although there is no a priori reason to think that what is believed is more highly valued, the data suggest that this may be the case, at least for the pasta product dealt with in this experiment. Figure 5 shows that the coefficient for shares (ordinate) covaries strongly with the coefficient for believability (abscissa.)

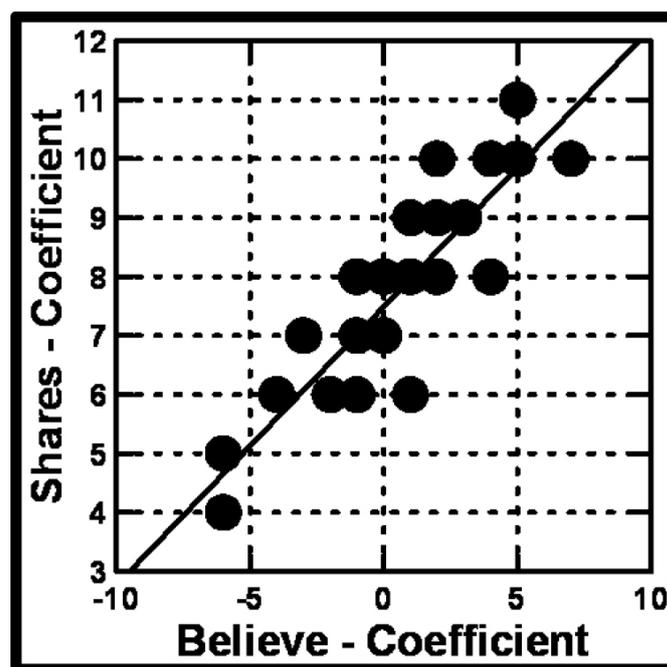


Figure 5: Scatterplot of 36 coefficients for shares (ordinate, based on model without additive constant) and the 36 coefficients for believability (abscissa, based on model with additive constant).

Dividing the respondents into Mind-Sets based upon the patterns of their coefficients

A key tenet of Mind Genomics is that for any topic where human judgment is involved, we can uncover different Mind-Sets, different sets of elements to which the respondent attend, and which are important in forming the judgment. As we saw in the previous data, there are a number of different elements to which the respondent attends which making a judgment of 'believability' or when deciding to 'invest,' at least in terms of the respondent saying that the respondent would invest. The data from the total panel suggest that there are far fewer elements driving 'believability,' and far more elements driving 'investment'.

We now turn to uncovering groups of respondents with different points of view about what is Believable, and in turn, what is worth an investment. The method used is called 'clustering.' The objective is to divide the population of 142 respondents into a small number of non-overlapping groups, so that the respondents in the same group show similar patterns of what they feel to be 'Believable,' and, afterwards, again divide the same respondents into a small number of non-overlapping groups so that respondents in the same group show similar patterns of what they feel to warrant an investment.' In effect we perform two cluster analyses, first for 'believe' and second for 'invest.'

Each respondent generated two sets of coefficients, one for Believable, and one for shares of investment. We use the method of k-means clustering, specifically defining a distance between each pair of respondents. Our first defines the distance between each pair of respondents as the quantity (1- Pearson R), where the Pearson R (Pearson correlation coefficient) shows the strength of a linear relation.

The Pearson R ranges from a high of +1 when two respondents are perfectly aligned (distance thus becomes 0), to a low of -1 when the respondents are perfectly aligned, but in the exact opposite direction (distance thus becomes 2.) Clustering then emerges with a limited set of groups, with the property that the distance between pairs of respondents in the group is low, and the distance between the centroids of the groups is high.

The general results from clustering the respondents into three Mind-Sets

To better understand the differences between believability and investing, i.e., between simple emotion and emotion expressed in economic terms, we clustered the respondents into three Mind-Sets, first on the 36 coefficients for believability, and then on the 36 coefficients for shares to invest.

Table 4 compares some of the externalities of the Mind-Sets versus the total panel.

Table 4. The surface or summary data about the different subgroups.

	Believe Total	Believe 3A	Believe 3B	Believe 3C	Invest Total	Invest 3D	Invest 3E	Invest 3F
Base size	142	96	27	19	142	53	48	41
Additive Constant	23	25	31	2	NA	NA	NA	NA
Mean Coefficient	1	-1	1	9	8	7	7	9
Standard Deviation Coefficient	3	2	7	7	1	2	2	2
Minimum Coefficient	-6	-4	-16	-6	4	3	4	4
Maximum Coefficient	7	3	16	22	11	13	11	15
Range of Coefficients	13	7	32	28	7	10	7	11
F Ratio (Signal/Noise)	1.71	0.65	1.73	1.64	0.88	0.85	0.34	0.58
P Value Regression	0.004	0.95	0.005	0.011	0.66	0.72	1.00	0.92

1. Believability clusters into three quite unequal size Mind-Sets. Investment clusters into three approximately equal-sized Mind-Sets. The clustering into approximately equal-sized segments for investment may indicate that there is no simple 'real' segmentation when 'money' is the evaluative criterion. It may be that inferences about one's mind from observing responses to economic-based questions, such as investment here, will not shed any light on the real motivations of respondents, nor shed any additional information on what to communicate to motivate behavior.
2. The average coefficients for the investment Mind-Sets are approximately equal. The average coefficients for believability are low for two Mind-Sets (Mind-Set 3A and 3B) and very low for the third Mind-Set (3C.) It is the elements which must do the work, especially for Mind-Set 3C for believability.
3. The standard deviation of the coefficients shows magnitude the variation of the coefficients within a group, whether total or Mind-Set, as does the range of coefficients. Believability shows a large standard deviation and range for two of the three Mind-Sets, and

a third Mind-Set which shows relatively less variability, The two Mind-Sets for Believability, 3B and 3C, dramatically differentiate among the elements. The third Mind-Set, 3A, does not. Investment also shows a large standard deviation and range for two of the three Mind-Sets, and a third Mind-Set which shows a lower range.

4. The analysis of variance done for believability and for invest, respectively, gives a sense of the 'signal to noise' ratio. The high the F ratio, the 'stronger the signal.' The F ratio and the p value associated with the F ratio both suggest more differentiation on believability than on investment. This suggests that '*homo-emotionalis*' is far more expansive than '*homo-economicus*.'

We finish the analysis with a look at the strongest performing elements for each rating variable, for total panel and for the three Mind-Sets. We look only at the high scoring elements for Believable and for invest, respectively (Table 5.) The summary below suggests the same three groups, albeit with somewhat different elements.

Table 5. Strongest performing elements for each Mind-Set.

	Believable – Mind Set 3A Base= 96 No strong elements	
	Believable – Mind Set 3B Base = 27 Pasta as a good, inexpensive food	
	Believable – Mind Set 3C Base = 19 Pasta contains good ingredients for body health	
	Invest – Mind Set 3D Base = 53 No strong elements (Like MS 3A)	
	Invest – Mind Set 3E Base = 48 Product appeal (Like MS 3B)	
	Invest – Mind Set 3F Base = 41 Body tone and energy (Like MS 3C)	
	Believe – Total Panel – No Strong Elements	Bel Total
	Believe - Mind-Set 3A – No Strong Elements	Bel 3A
	Believe – Mind-Set 3B – Pasta as good and inexpensive food	Bel 3B
A6	High in fiber good carbs pasta helps you stay full longer and avoid overeating...so your mind stays focused and razor sharp	16
D4	Try our Pasta trio... with Good Carbs pasta + sauce + seasoning: 3-in-one pack	13
D5	Love to stock-up on Good Carbs pasta deals...such as weekly specials and coupons	13
A3	Increase your energy, naturally and dramatically by selecting the wholesome, ‘Good Carbs’ our bodies were designed to eat	12
	Believe – Mind Set 3C – Pasta contains good ingredients for body health	Bel 3C
B6	Iron deficiency is a natural cause of fatigue... Fortified Pasta keeps your hemoglobin and energy levels high	22
B5	Enriched pasta is fortified with folic acid – essential to your muscle health	20
A6	High in fiber good carbs pasta helps you stay full longer and avoid overeating...so your mind stays focused and razor sharp	19
D4	Try our Pasta trio... with Good Carbs pasta + sauce + seasoning: 3-in-one pack	19
A1	Eating the right kinds of carbohydrates is your secret to losing weight... choose ‘Good Carbs’ pasta to stay slim	17
A2	Good Carbs pasta lowers cholesterol levels, helps to remove toxins from the body...bringing out your inner beauty	15
E1	Enjoy the rich and artisanal taste of Good carbs pasta	15
E4	Inviting appearance of Fortified pasta with visible ridges...allowing each strand to hug the sauce	14
A3	Increase your energy, naturally and dramatically by selecting the wholesome, ‘Good Carbs’ our bodies were designed to eat	12
A4	Greater thermic effect in good carbs pasta, naturally stimulates metabolism and promotes fat loss...so you are always quick on your feet	12
C2	A filling Good Carbs pasta meal makes you calm and reduces stress	12
D1	Get the most out of your dollar: buy Fortified pasta, an affordable goodness!	12
F1	Pretty convincing.... for a confirmed carb skeptic	12
B4	Only one cup of enriched fortified pasta is a good source of nutrients... iron and several B-vitamins...so you look your BEST	10
C3	Relax...put away your fear of carbs... by choosing Good Carbs Pasta!	10
C4	Put some pep in your step: feel confident with the extra energy boost from Fortified Pasta!	10
C6	Feeling dull? Losing concentration by mid-day? Fortified Pasta nutrients... will help you regain focus	10
D6	Look out for the unique Quality Assurance mark ... on Good Carbs Pasta packaging	10
	Invest Total - No clear pattern	
A1	Eating the right kinds of carbohydrates is your secret to losing weight... choose ‘Good Carbs’ pasta to stay slim	11
A3	Increase your energy, naturally and dramatically by selecting the wholesome, ‘Good Carbs’ our bodies were designed to eat	10
D4	Try our Pasta trio... with Good Carbs pasta + sauce + seasoning: 3-in-one pack	10
A2	Good Carbs pasta lowers cholesterol levels, helps to remove toxins from the body...bringing out your inner beauty	10
A6	High in fiber good carbs pasta helps you stay full longer and avoid overeating...so your mind stays focused and razor sharp	10
	Invest 3D - Product appeal	
D4	Try our Pasta trio... with Good Carbs pasta + sauce + seasoning: 3-in-one pack	13
E4	Inviting appearance of Fortified pasta with visible ridges...allowing each strand to hug the sauce	10
A3	Increase your energy, naturally and dramatically by selecting the wholesome, ‘Good Carbs’ our bodies were designed to eat	10
A6	High in fiber good carbs pasta helps you stay full longer and avoid overeating...so your mind stays focused and razor sharp	10

E6	Mild taste and texture of Fortified Pasta ... with that little hint of an earthy/ wheaty tone	10
Invest 3E -Body tone and energy		
A3	Increase your energy, naturally and dramatically by selecting the wholesome, 'Good Carbs' our bodies were designed to eat	11
A2	Good Carbs pasta lowers cholesterol levels, helps to remove toxins from the body...bringing out your inner beauty	10
A4	Greater thermic effect in good carbs pasta, naturally stimulates metabolism and promotes fat loss...so you are always quick on your feet	10
Invest 3F - Health features		
A1	Eating the right kinds of carbohydrates is your secret to losing weight... choose 'Good Carbs' pasta to stay slim	15
C4	Put some pep in your step: feel confident with the extra energy boost from Fortified Pasta!	14
D4	Try our Pasta trio... with Good Carbs pasta + sauce + seasoning: 3-in-one pack	13
A2	Good Carbs pasta lowers cholesterol levels, helps to remove toxins from the body...bringing out your inner beauty	12
B5	Enriched pasta is fortified with folic acid – essential to your muscle health	12
A4	Greater thermic effect in good carbs pasta, naturally stimulates metabolism and promotes fat loss...so you are always quick on your feet	11
A6	High in fiber good carbs pasta helps you stay full longer and avoid overeating...so your mind stays focused and razor sharp	11
C3	Relax...put away your fear of carbs... by choosing Good Carbs Pasta!	11
C2	A filling Good Carbs pasta meal makes you calm and reduces stress	11
B2	Since oxygen supply to blood is aided by iron, incorporate fortified pasta into your eating plans... get more 'smarts' out of your food	11
A5	Make a BIG difference to your mental faculties with regular intake of Good Carbs pasta...your companion in higher order thinking	11
B1	Iron, when consumed in the diet, builds concentration among students and professionals...another reason to choose Fortified Pasta	11
B6	Iron deficiency is a natural cause of fatigue... Fortified Pasta keeps your hemoglobin and energy levels high	11
B3	Would you like to have radiant looking skin? Fortified Pasta takes multigrain to a whole new level... giving you many vitamins & minerals... for that flattering look	10
D6	Look out for the unique Quality Assurance mark ... on Good Carbs Pasta packaging	10
C5	Eat your serving of Fortified Pasta...find yourself smiling through the day	10
D5	Love to stock-up on Good Carbs pasta deals...such as weekly specials and coupons	10
D3	Fortified pasta... goodness in a pack...worth the extra money	10
D2	Get quality & value: purchase Fortified pasta - your sensible choice	10
A3	Increase your energy, naturally and dramatically by selecting the wholesome, 'Good Carbs' our bodies were designed to eat	10
F4	Like interacting with people and offering your opinions freely? Fortified pasta keeps YOU going!	10
B4	Only one cup of enriched fortified pasta is a good source of nutrients... iron and several B-vitamins...so you look your BEST	10

Finding the three Believe-based mind-sets in the population

The value of Mind Genomics is to understand what is important, believable, or worth investing. The key discovery is that there are different mind-sets. What might be an average-performing element to the total panel might, in fact, be very important to a mind-set. It can increase believability, or it can increase the amount that one says she or he is willing to invest.

These mind-sets do not distribute in the more typical ways in which we divide the population. Indeed, a person may not even know the mind-set to which she or he belongs. It may require an external test, similar metaphorically to a genetic test, to discover the mind-set to which a person belongs. How then, does one proceed to create a mind-set or 'viewpoint' identifier.

The approach followed here identifies the elements which best differentiate among the segments, based upon a binary response (no or yes.) The pattern of responses to these elements, phrased as questions, assigns a respondent to a one of the three mind-set patterns for believability.

The following website shows the Personal Viewpoint Identifier, and as of this writing (January, 2019) is available: <http://162.243.165.37:3838/TT06/>. Figure 6 shows the welcome screen of the personal viewpoint identifier. Figure 7 shows the three feedback screens, based upon the pattern of responses. Depending upon how the individual respondents, the individual will be assigned to one of the three mind-sets for believability.

Once the Personal Viewpoint Identifier is created, it is a simple matter to use it to assign new individuals to the just-uncovered mind-sets, and then relate mind-set memberships to many other variables of behavior that would be infeasible with the small group of 142 respondents.

Discussion and Conclusion

The focus of this paper has been on a cartography of the mind, specifically on the area of a food (pasta), positioned as a 'good-for-you' product both in terms of health, and in terms of appearance/performance, and with evaluation using two different types of criteria, believability and amount willing to invest.

With the emerging science of Mind Genomics, virtually any topic involving human judgment can be explored in depth, using cognitively meaningful input, and criteria of judgment which may differ from the usual criteria of liking or purchase intent.

With metaphor of cartography, and with the tools of Mind Genomics, we emerge quickly with a deeper understanding of how people 'think' about a product or a situation. Mind Genomics moves us closer to what might be called quantitative patterns of qualitative experience. Ideas in the mind of people emerge with numbers based upon the criteria used for judgment. In turn, we end up with a global picture of how the topic is considered in the minds of people. Finally,

mind-sets emerge, so what was hitherto a group of individuals perhaps defined by WHO THEY ARE can now be defined by HOW THEY THINK. How they think, in terms, is the quick, intuitive response, the 'fast thinking' more indicative of ordinary life, rather than the slow, considered thinking used primarily for the rare, unusual, risk situation [9].

To sum up, the benefit to science is the richness of the data, its systematized format, allowing us to understand either responses to single ideas (believability, amount willing to invest), patterns relating people (believers versus investors), or patterns relating ideas (belief in the idea versus how much willing to invest.)

Welcome to Shiny Typing Tool of study:
Messaging food and inner beauty together

Your answers will help us to develop better food products.

How likely are you to believe in this new product based on the presented statements?

Feeling dull? Losing concentration by mid-day? Fortified Pasta nutrients...will help you regain focus	Not at all likely to believe	Very likely to believe
Love to stock-up on Good Carbs pasta deals...such as weekly specials and coupons	Not at all likely to believe	Very likely to believe
High in fiber good carbs pasta helps you stay full longer and avoid overeating...so your mind stays focused and razor sharp.	Not at all likely to believe	Very likely to believe
Inviting appearance of Fortified pasta...with visible ridges...allowing each strand to hug the sauce.	Not at all likely to believe	Very likely to believe
Enriched pasta is fortified with folic acid - essential to your muscle health	Not at all likely to believe	Very likely to believe
Pretty convincing...for a confirmed carb skeptic	Not at all likely to believe	Very likely to believe

Please provide your email address.

We will not share your e-mail address with third-parties and it will not be used for marketing purposes.

Figure 6. Welcome screen of the online deployed typing tool.

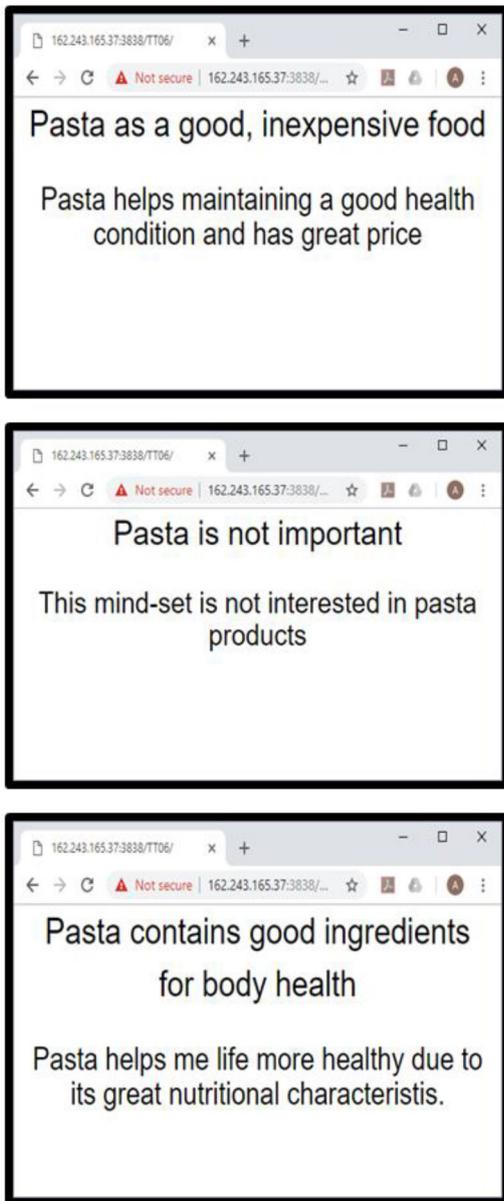


Figure 7. The result screens presenting the mind-set memberships and short mind-set descriptions of each mind-set.

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