

Research Article

Motivating Mammography: Combining AI and Mind Genomics to Discover What a Patient Needs to Hear

Mishall Ahmed Baig¹, Stephen Rappaport² and Howard Moskowitz^{3*}

¹Global Population Health Management Forum, Brooklyn, NY, USA

²SDR Consulting, Inc., Norwalk, CT, USA

³Cognitive Behavior Insight, Inc., White Plains, NY, USA

*Corresponding author: Howard Moskowitz, Cognitive Behavior Insight, Inc., White Plains, NY, USA

Received: December 20, 2023; Accepted: December 30, 2023; Published: January 05, 2024

Abstract

The study focused on the messages which might enhance women's participation in mammogram screening. The study followed the Mind Genomics process of presenting respondents with different combinations of relevant messages, identifying the strong performing messages for each respondent, and clustering respondents on the basis of the patterns of elements which drive positive responses. The messages themselves were developed using AI, allowing the researcher ahead of the experiment to gain a broad education-type overview of the types of messages that could be used. Two mind-sets of respondents emerged, representing different patterns of messages which are deemed motivating. Mind-Set 1, "Motivated and Informed Women," seeks improved breast health, values screenings, with the goal to minimize health risk, and maximize well-being. Mind-Set 2, "Concerns and Motivations," focuses on the mammogram experience itself, the mammogram risks, comfort, and cost, demanding accurate diagnoses. It may be possible to increase mammogram screening by assigning a person to one of these mind-sets. The Mind-Set Assigner (previously called Personal Viewpoint Identifier (PVI)) comprises a set of six questions based upon the study, the patterns of answers to which assign a person to either Mind-Set1 or Mind-Set 2. The Mind-Set assigner offers the promise of a personalized approach to understanding what people need to hear to ensure better health.

Introduction

Despite its significant advantages in understanding human perception and decision-making, contemporary technology involving health messages is confronted at every turn by hosts of drawbacks and challenges. Among these, data privacy and security concerns loom large as the collection and storage of vast amounts of personal data raise questions about safeguarding sensitive information [1]. Moreover, the potential for bias and unfairness in machine learning algorithms remains an ongoing challenge, demanding continual efforts to ensure fairness and reduce [2]. A consequence of the efforts to maintain privacy in a data-intensive world is the focus on making sure that key information about a patient is safeguarded [3]. Those efforts move the focus from advancing by understanding the patient as a human being towards protecting the patient who could be the source of possibly compromising data.

The focus of this paper moves attention from understanding the body and behavior of the patient to the mind of the patient as a consumer of the health care experience. The objective of this paper is to showcase what can be achieved in just a few hours, even with limited prior knowledge of a subject. Our goal is to gain insights into how people perceive the ordinary world, make decisions, and, perhaps most crucially, understand the myriad ways in which everyday individuals view topics in their daily lives using the innovative approach of Mind Genomics. Instead of focusing on exceptional or unusual circumstances, Mind Genomics centers on the daily, commonplace world in which most people live.

For this exercise, we have chosen to examine the issue of mammography, a vital aspect of healthcare, as it pertains to women's participation in breast cancer screening. The focus will be on the person as a receiver of health messages, the person being likened to a consumer, the health messages being the motivational communications to get the consumer, the woman, to buy the product.

When healthcare providers screen patients for breast cancer, their primary objective is to encourage greater participation among women in screening mammograms. Increasing participation needs a multifaceted approach which goes beyond simply knowing what to say. Rather, it is critical to understand and interpret women's responses and, in turn, effectively address their concerns. Communication plays a pivotal role in this process. Providers must effectively convey the importance of regular screenings and underscore the potential to save lives through early detection.

The literature about mammography is large, not surprisingly because of the pivotal role of mammography in detecting breast cancer. The existing literature recognizes the importance of the doctor-patient relationship, and the emotions involved in breast cancer. There is a significant literature on mammograms and mammography. Part of the focus is on the medical aspects of mammograms as a preventive for breast cancer, which belongs in the world of biological and medical science [4,5].

Unfortunately, the existing literature often falls short when it comes to delving into the communicating with patients, even though

the literature does recognize the psychological and emotional effects on individuals undergoing mammography, with a predominant focus on clinical and technical facets [6], as well as keeping appointments [7-9]. Whereas some studies do touch upon the significance of communication and addressing patient concerns, there remains the important gap regarding the specific language, words, and customized communication strategies which truly resonate with individuals.

Closing this gap by understanding the unique needs, assessing the psychological impact, and recognizing the decision-making processes of patients is paramount. Such an approach can significantly enhance the effectiveness of breast cancer screening and improve the overall patient experience, ultimately leading to increased participation rates and earlier detection of cancer.

The important thing to keep in mind is that the approach presented here breaks new intellectual ground, lying between the world of the scientific establishment and the world of the practitioner. As will be shown below, the objective is to understand the way the person thinks, letting the patterns which emerge suggest directions for research. In scientific parlance, the traditional way, the hypothetico-deductive system [10] with its effort to create science step-by-step gives way to the more intellectually adventurous but less rigorous effort called 'grounded theory' [11]. In a sense the approach presented here will end up being a 'user's manual of the everyday mind.'

Mind Genomics Offers a New Perspective on Thinking

Surveys are popular, easy to use, and understand. However, polls have fundamental issues. One of the worst is susceptibility to respondent bias toward giving the "correct answer." This bias is especially harmful when the topic is emotional, or when the respondent doesn't know the answer. The desire to appear positive often leads to hesitation to respond negatively [12].

A second, subtle bias is lack of context. The respondent is instructed to rate or to rank relevance of distinct characteristics like price, nutrition, brand, etc. Respondents typically adapt their rating criteria to fit the thing being rated. Interspersing topic examples is better. Instead of asking how important 'price' is against 'availability in store', a more productive technique may be to present different combinations of features, and afterwards deconstruct the response to the combination into the contribution of the single components of the combinations.

Mind Genomics has been developed to address these biases. Mind Genomics combines experimental psychology (psychophysics), statistics (experimental design), and consumer research (focus on the world as is, rather than put the respondent through an artificial situation, unless that artificial situation is of direct scientific interest). The past history and future opportunities Mind Genomics have been described in previous papers [13-15].

Mind Genomics traces its history to three disciplines:

1. Psychophysics - The oldest discipline of experimental psychology. Psychophysics examines how humans interpret external inputs. Traditional psychophysics connects the physical and psychological worlds. Traditional psychophysics

focuses on 'measuring' the intensity of perception, such as beverage sweetness [16].

2. Experimental design is a discipline in statistics which examines how independent factors combine to create a dependent variable. Mind Genomics adopts that concept but focuses on how thoughts interact. It might be called the 'algebra of the mind.'
3. Consumer research explores daily life. Mind Genomics explores everyday scenarios rather than developing contrived ones, in its effort to understand the way people think. Consumer research shows how individuals act in the real world as consumers and humans.

The Mind Genomics approach has evolved from paper and pencil evaluations of vignettes (combinations of ideas or messages, now called 'elements') to a DIY (do it yourself) system which allows rapid, inexpensive study creation using a template combined with artificial intelligence to help the researcher think through a topic, along with subsequent automated analysis of the data and reporting in a user-friendly set of tables.

In early versions of the Mind Genomics science, it was up to researchers to develop the raw materials, so-called 'elements' or messages. The elements often numbered in the dozens, and occasionally far more. The researcher categorized the elements into like-ideas, manually created the vignettes, viz., combinations of elements, checking that the elements were statistically independent of each other, and that mutually contradictory elements never appeared together. The process was tedious, frustrating, required a great deal of up-front preparation, took a long time, and ended being expensive when the time of the researcher was factored-in to the total cost.

Implementing the early Mind Genomics studies was also a challenge, and expensive. The studies were presented on a local computer, with respondents pre-recruited to participate. All respondents evaluated a randomized set of combinations or vignettes, selected from the original large set of vignettes. During the course of the supervised evaluation on the local computer, the respondent would end up evaluating 50-100 vignettes in 20-30 minutes. The results were pooled and analyzed by total panel and self-identified subgroups, with subgroups formed by a questionnaire about attitudes and practices on the problem. The Internet evolved the Mind Genomics approach to a structured, simple design (four categories or now four 'questions', four elements or answers per category), a basic experimental design with 24 statistically appropriate combinations. The underlying design ensured that the 16 elements are statistically independent and set up for immediate analysis. The data could be analyzed by OLS (ordinary least squares) regression at the level of a defined group or respondents, or even at the level of an individual respondent. Furthermore, Mind Genomics ensured that each respondent would evaluate 24 different vignettes, or combinations, a method halfway between the constricting requirements of a single design replicated for each respondent, and the combinations encountered in a cross-sectional study with the combinations of independent variables being uncontrolled. The benefit of the permuted design was that it was no

longer necessary to know the answer before doing the study. The study would end up covering many of the possible combinations, using a systematized permutation system [17], reducing a lot of the need for prior knowledge.

A Worked Example - What Goes Through the Mind of a Female Patient When Thinking about Mammography?

The rest of this paper shows study design, implementation, and analysis of a study on communications about why a patient should consider mammography. The study goal was to generate a new topic and advance it via AI. AI becomes a ‘second set of eyes’ for question-and-answer-development at the time of set-up, and for discovery of themes at the time of analysis.

Mind Genomics starts with a query, a brief paragraph to explain the situation and the research objective. The statement is constructed to allow the embedded link to AI (Idea Coach), to generate the appropriate query to Chat GPT 3.5 (Liu et. al., 2023) [18]. For this study, the brief paragraph was: *Explain to me exactly how I should talk to women so I can convince them to get their yearly mammogram? I want to talk to them as a doctor who is concerned about their health as their mother or their daughter. please make the question easy to understand, filled with emotion and no more than 12 words.* Figure 1 shows a schematic of these first steps of the set-up process.

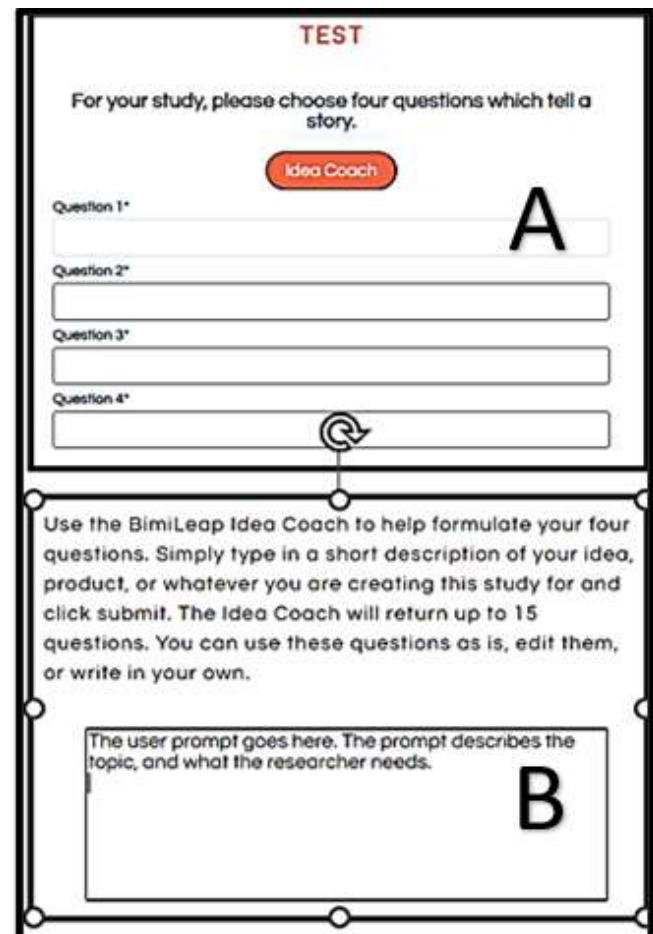


Figure 1: Schematic process. Panel A shows the space for four questions. Panel B shows a schematic ‘general background prompt’ given to Idea Coach.

Generating Questions to Answer the General Background Prompt

The researcher requests Idea Coach (AI) to provide 15 questions based upon the general prompt (see Figure 1, Panel B). The researcher can vary the general background prompt given to Idea Coach or can re-run the same request several times. The results are provided immediately, as well as recorded in the Idea Book, along with a set of AI based ‘summarizations’ and expansions of the topic (Table 1). These questions may be ‘on target.’ If not, the researcher can tweak the paragraph to guide the AI, run Idea Coach again, and indeed several times, each time learning more about the topic through the questions provided.

A user-trend has emerged during the past several months since the Idea Coach was incorporated into Mind Genomics. ‘Newbies’, beginning researchers, find this process with the Idea Coach to be pleasant, entertaining, and anxiety-reducing. Their excitement about research increases. And, as a bonus, after some experiences with Idea Coach, even in one study, the new researcher begins to feel empowered to add in her or his own questions.

Idea Coach now analyzes returned questions instead of just coaching. Table 2 shows how Idea Coach (viz., AI) uses a cue about ‘themes’ to find commonalities in Table 1 queries. Again, the Idea Coach summarizes ‘themes’ for each researcher-generated question set. The researcher could use Idea Coach say 10x to get 10 theme analyses, one for each set of returned questions. One could analyze all themes for all aspects, but the bookkeeping to eliminate similar-but-not-identical issues would take time.

AI then finds ‘holes’ in themes, a major benefit. Table 3 presents the third analysis of the first set of questions, ‘what is missing.’

Table 1: The first set of questions emerging from the Idea Coach in response to the paragraph written by the research, which generates the query. The text in Table comes from the Idea Book provided to the researcher after the element creation has been completed, both for questions and for answers.

Questions - Results 1
The prompt provided to Idea Coach by the researcher: Explain to me exactly how I should talk to women so I can convince them to get their yearly mammogram? I want to talk to them as a doctor who is concerned about their health as their mother or their daughter. please make the question easy to understand, filled with emotion and no more than 12 words
Topic Questions:
“Do you want to take control of your health and protect yourself?”
“What would make you feel more secure about your breast health?”
“Are you aware that early detection can save lives?”
“How can I assure you that getting a mammogram is worth it?”
“Can we discuss the reasons why getting a mammogram is essential?”
“What if a mammogram could offer you peace of mind?”
“Would you feel more at ease if we went together?”
“Can I offer you reassurance that mammograms are safe and painless?”
“Are you ready to prioritize your well-being and get screened?”
“How can I support you in scheduling your yearly mammogram?”
“Would your loved ones want you to miss out on early detection?”
“Are you willing to take a small step now for a healthier future?”
“Have you considered the relief of knowing your breast health status?”
“What if getting a mammogram could save your life or someone you love?”
“Can we explore the peace of mind that regular screenings can provide?”

Finally, Tables 4-6 look at possible innovations in products and services.

Creating Answers to Questions

The second step creates four answers to each question selected by

Table 2: Themes emerging from the set of questions returned in the first iteration of Idea Coach.

Themes
1. Importance of early detection and saving lives - Understanding the importance of early detection in saving lives - Assuring the value and worth of getting a mammogram - Saving lives through mammograms
2. Empowerment and control over health - Taking control of one's health and protecting oneself - Feeling more secure about breast health - Support and reassurance in getting screened - Prioritizing well-being and scheduling yearly mammograms
3. Support and impact of loved ones - Considering the support and impact of loved ones - Taking small steps for a healthier future
4. Peace of mind and relief - Offering peace of mind through mammograms - Finding relief in knowing one's breast health status - Exploring the peace of mind provided by regular screenings

Table 3: Suggestion of ideas that may be missing from the set of questions returned by Idea Coach.

What is missing
Some missing topic questions could include: - What are the potential risks or drawbacks of getting a mammogram? - What are the statistics or success stories of early detection through mammograms? - How can I find a reputable and trusted healthcare provider for mammograms? - Are there alternative methods or technologies for breast health screening? - How often should I get a mammogram and at what age should I start?

Table 4: Suggestion of alternative viewpoints, viz., contrary ideas.

Alternative viewpoints on the topic questions
1. "I would rather not take control of my health and rely on natural remedies or alternative therapies." 2. "Feeling secure about my breast health is not a priority for me as I believe in living in the present moment." 3. "I am aware that early detection can save lives, but I believe in trusting my body's intuition and not relying solely on medical screenings." 4. "I don't believe that getting a mammogram is worth it as it can sometimes lead to false positives or unnecessary treatments." 5. "I think there are other essential aspects of health that should be prioritized over mammograms." 6. "Peace of mind can be achieved through other means, such as mindfulness and self-care practices." 7. "I prefer to handle my health decisions independently and do not feel the need for someone to accompany me for a mammogram." 8. "I have heard of cases where mammograms have caused discomfort or negative side effects, so I am not convinced they are completely safe and painless." 9. "I have other health concerns that I prioritize over getting screened for breast health." 10. "I believe in trusting my body's natural healing abilities and do not place much importance on medical screenings." 11. "My loved ones would support my decision to prioritize my overall well-being rather than just focusing on breast health." 12. "I prefer to take each day as it comes and not worry about the future or potential health issues." 13. "I am not convinced that knowing my breast health status would bring me relief as it could also lead to unnecessary anxiety or concern." 14. "I believe that taking care of my physical and mental health through lifestyle choices is more important than relying solely on medical screenings."

Table 5: Suggestion of the likely audience.

Interested Audiences
1. Women aged 40 and above: This audience would be interested in the topic questions as they are at an increased risk of developing breast cancer as they age. They may want to take control of their health and protect themselves, be reassured about their breast health, or understand the importance of early detection.
2. Individuals with a family history of breast cancer: People with a family history of breast cancer may be more concerned about their breast health and would want to feel secure by getting regular screenings. They may also be interested in learning about the benefits and importance of early detection.
3. Healthcare professionals: Doctors, nurses, and healthcare professionals may be interested in discussing the reasons why getting a mammogram is essential to educate their patients. They may also want to offer reassurance about the safety and painlessness of the procedure to encourage their patients to prioritize their well-being and get screened.
4. Close friends or relatives: Individuals close to someone who may be due for a mammogram, such as close friends or relatives, may be interested in supporting their loved one by discussing the topic questions. They may want to offer reassurance, discuss the relief of knowing their breast health status, or encourage them to prioritize their well-being and get screened.
5. Support groups or organizations: Support groups or organizations focused on breast cancer or women's health may be interested in exploring the benefits and peace of mind that regular screenings can provide. They may want to raise awareness about the importance of early detection and support individuals in scheduling their mammograms.

the researcher. The researcher must come up with four answers to each question. The same process is followed, with Idea Coach providing sets of 15 answers to a question, and with the researcher selecting the four answers for each study. The final four sets of questions appear below. The substantive part of the question as returned by Idea Coach is shown in italics. The other part of the question, viz., the phrase 'Elaborate in detail and in 15 words or less' was added to the Idea Coach query to ensure simple to understand answers to the question.

1. Question A: Elaborate in detail and in 15 words or less *The importance of regular mammograms for women?*"
2. Question B: Elaborate in detail and in 15 words or less *Any concerns or fears regarding mammograms?*"
3. Question C: Elaborate in detail and in 15 words or less *Prioritize your health together. When can I expect you to schedule your mammogram?*"
4. Question D: Elaborate in detail and in 15 words or less *The peace of mind that comes with early breast cancer detection?*

Once again the process with Idea Coach ends up educating the researcher as the researcher continues to request the four answers for each question, with each request generating four answers. Many users consider this activity crucial. The shock of seeing 15 answers appear a few seconds after the question is asked is remarkable, and often quite motivating.

Each set of the 15 solutions undergoes the same set of AI analyses, similar in depth to the AI analyses above done for the questions, but with a few different queries. The first 15 answers to the first question appear in Table 7, which also shows the extensive AI summarization.

Table 6: Suggestion of innovations in products services, experiences, policies.

<p>Innovations</p> <ol style="list-style-type: none"> Importance of early detection and saving lives: <ul style="list-style-type: none"> - Mobile mammography vans or clinics to bring mammograms to underserved areas or communities with limited healthcare access. - Online or mobile apps that provide reminders and resources for scheduling and booking mammograms. - Educational campaigns and initiatives targeting specific communities or demographics to raise awareness about the importance of early detection. Empowerment and control over health: <ul style="list-style-type: none"> - Personalized breast health assessment tools that help individuals understand their individual risk factors and take proactive steps to protect their breast health. - Subscription-based services that provide access to regular at-home breast self-examinations kits, along with educational materials and resources. - Virtual support groups or online communities where individuals can connect with others facing similar situations and share experiences and advice. Support and impact of loved ones: <ul style="list-style-type: none"> - Partner or family member discounts or incentives for accompanying and supporting loved ones during mammogram appointments. - Collaborative community programs where volunteers provide transportation or accompaniment services for those who may otherwise struggle to access mammograms. - Policies that provide paid time off for individuals to accompany their loved ones to mammogram appointments or support them during their breast health journey. Peace of mind and relief: <ul style="list-style-type: none"> - Telemedicine services that allow individuals to discuss mammogram results and receive counseling or support from healthcare professionals from the comfort of their own homes. - Innovative mammography techniques or equipment that provide clearer and more accurate results, reducing false positives and the need for additional testing. - Insurance coverage policies that eliminate or reduce out-of-pocket costs for mammograms, providing financial relief and peace of mind for individuals seeking regular screenings.

Table 7: The first set of answers to Question #1: *Elaborate in detail and in 15 words or less the importance of regular mammograms for women.*

<p>Answers - Results 1</p> <p>Elaborate in detail and in 15 words or less the importance of regular mammograms for women?"</p> <p>Topic Statements:</p> <p>Early detection of breast cancer.</p> <p>Reduces mortality rates.</p> <p>Identifies the presence of tumors or abnormalities.</p> <p>Increases chances of successful treatment.</p> <p>Helps in diagnosing non-cancerous conditions like cysts or fibroids.</p> <p>Provides baseline images for future comparisons.</p> <p>Monitors changes in breast tissue over time.</p> <p>Enhances the effectiveness of treatment options.</p> <p>Impacts prognosis and survival rates.</p> <p>Allows for timely intervention and appropriate medical decisions.</p> <p>Identifies potential cancer in its early stages.</p> <p>Enables less invasive treatment options.</p> <p>Provides peace of mind and reduces anxiety.</p> <p>Offers opportunities to participate in clinical trials.</p> <p>Helps in creating personalized screening plans based on individual risk factors.</p> <p>Key Ideas</p> <ol style="list-style-type: none"> Early detection of breast cancer: The importance of detecting breast cancer at an early stage. Reduces mortality rates: Early detection leads to lower death rates from breast cancer. Identifies the presence of tumors or abnormalities: Mammograms can detect tumors or abnormalities in breast tissue. Increases chances of successful treatment: Early detection increases the likelihood of successful treatment for breast cancer. Helps in diagnosing non-cancerous conditions like cysts or fibroids: Mammograms can also identify non-cancerous conditions. Provides baseline images for future comparisons: Mammograms provide initial images for future comparison and monitoring. Monitors changes in breast tissue over time: Mammograms can track changes in breast tissue over time. Enhances the effectiveness of treatment options: Early detection improves the effectiveness of treatment options for breast cancer. Impacts prognosis and survival rates: The prognosis and survival rates for breast cancer are influenced by early detection. Allows for timely intervention and appropriate medical decisions: Early detection enables prompt intervention and appropriate medical decisions for breast cancer. Identifies potential cancer in its early stages: Mammograms can detect breast cancer at its early stages. Enables less invasive treatment options: Early detection allows for less invasive treatment options for breast cancer. Provides peace of mind and reduces anxiety: Early detection can provide peace of mind and alleviate anxiety related to breast cancer. Offers opportunities to participate in clinical trials: Early detection opens up opportunities to participate in clinical trials for breast cancer. Helps in creating personalized screening plans based on individual risk factors: Mammograms assist in developing personalized screening plans based on individual risk factors for breast cancer. <p>Perspectives</p> <p>Plus factors:</p> <ul style="list-style-type: none"> - Early detection of breast cancer - Reduces mortality rates - Increases chances of successful treatment - Provides baseline images for future comparisons - Enhances the effectiveness of treatment options - Impacts prognosis and survival rates - Allows for timely intervention and appropriate medical decisions
--

Minus factors:

- None mentioned in the provided topic statements

Interesting factors:

- Identifies the presence of tumors or abnormalities
- Helps in diagnosing non-cancerous conditions like cysts or fibroids
- Monitors changes in breast tissue over time
- Identifies potential cancer in its early stages
- Enables less invasive treatment options
- Provides peace of mind and reduces anxiety
- Offers opportunities to participate in clinical trials
- Helps in creating personalized screening plans based on individual risk factors

Additional information

The missing aspect that can complete an understanding of the topic is the specific method or technology used for early detection of breast cancer, such as mammography, MRI, ultrasound, or genetic testing.

Alternative Viewpoints

1. Early detection of breast cancer may not necessarily reduce mortality rates, as some studies suggest that aggressive treatment options are more effective in improving survival rates.
2. Identifying the presence of tumors or abnormalities through early detection may lead to unnecessary biopsies and invasive procedures, causing anxiety and psychological distress for patients.
3. Although early detection increases the chances of successful treatment, it may also result in overtreatment, as some detected abnormalities may never progress to become cancerous or cause harm.
4. Diagnosing non-cancerous conditions through early detection may create unnecessary worry and financial burden for patients, as these conditions do not require immediate intervention or treatment.
5. While baseline images for future comparisons may be beneficial, the technology used in early detection, such as mammograms, may have limitations in detecting certain types of breast cancer, particularly in women with dense breast tissue.
6. Monitoring changes in breast tissue over time may lead to unnecessary surveillance and imaging, as benign abnormalities are common and may not require ongoing monitoring or intervention.
7. While early detection may enhance the effectiveness of treatment options, it may also result in detrimental side effects and complications from aggressive treatments.
8. The impact of early detection on prognosis and survival rates may vary depending on individual factors, such as age, overall health, and presence of other comorbidities.
9. Timely intervention and appropriate medical decisions through early detection may result in overtreatment or over-diagnosis, as not all detected abnormalities require immediate intervention.
10. Identifying potential cancer in its early stages may lead to increased anxiety and mental distress for individuals, as they live with the constant fear of recurrence or progression.
11. While less invasive treatment options may be possible with early detection, they may not always be the best treatment choice for each individual, as treatment decisions should be based on a comprehensive assessment of the patient's overall health and individual circumstances.
12. While early detection provides peace of mind for some individuals, it may also result in constant worry and fear of recurrence, causing significant psychological burden.
13. Opportunities to participate in clinical trials through early detection may lead to potential side effects and unknown risks, as the experimental treatments involved in these trials are not yet widely tested for safety and effectiveness.
14. Creating personalized screening plans based on individual risk factors may lead to both over-screening and under-screening, as the accuracy of risk prediction models may vary and may not capture all relevant factors for each individual.

Interested Audiences

1. Women over the age of 40: As breast cancer is most commonly diagnosed in women over 40, this audience would be particularly interested in early detection techniques to reduce their risk and ensure early intervention if necessary.
2. Survivors of breast cancer: Those who have previously battled breast cancer would be interested in topics related to detection, monitoring, and treatment options to aid in their ongoing care and help prevent reoccurrence.
3. Healthcare professionals: Medical professionals, especially those specializing in oncology or women's health, would be interested in these topics to stay updated on the latest advancements and guidelines for breast cancer detection and treatment. This knowledge would enable them to provide the best care to their patients.
4. Advocacy groups and organizations: Individuals who are dedicated to raising awareness about breast cancer, supporting survivors, and promoting early detection would find these topics important for their mission. They can utilize this information to educate their members and the general public.
5. Researchers and scientists: Professionals in the field of cancer research would be interested in early detection methods and the impact they have on mortality rates. This information could help in developing new therapies and improving existing treatments.
6. Health insurance companies: Insurance providers have an interest in staying up to date on the most effective and cost-efficient strategies for detection and treatment. Early detection may result in reduced healthcare costs by identifying cancer in its earlier stages.
7. Government health agencies: Public health organizations and government agencies focused on cancer prevention and control would be interested in these topics to inform policy decisions and public health initiatives related to breast cancer.
8. Individuals with a family history of breast cancer: Those with a family history of the disease may be particularly interested in topics related to personalized screening plans and risk factors, as they might have a higher risk of developing breast cancer themselves.
9. Individuals with anxiety or fear related to breast cancer: Anyone with anxiety or fear surrounding breast cancer would be interested in topics that promote peace of mind and provide information about early detection methods. Understanding the benefits of early detection can help alleviate anxiety and encourage proactive healthcare decisions.

Opposing Audiences

1. Individuals who oppose medical imaging or invasive procedures: Some individuals may be skeptical or wary of any medical procedure involving radiation or other forms of imaging. They may have concerns about the potential risks and side effects associated with the procedures and may therefore oppose the topic statements advocating for early detection of breast cancer through imaging methods.
2. Anti-screening proponents: There are some individuals or groups who argue against widespread screening for certain types of cancers, including breast cancer. They may believe that the potential harms of overdiagnosis and overtreatment outweigh the benefits of early detection. They argue that unnecessary biopsies, surgeries, and treatments can lead to physical and psychological harm.

3. Natural health advocates: Certain individuals who advocate for alternative or natural health practices may oppose the topic statements. They may argue that early detection and treatment of breast cancer should focus on non-invasive methods such as lifestyle changes, diet, and herbal remedies, rather than relying on medical imaging and conventional treatments. They may also emphasize holistic approaches to health and wellness rather than relying heavily on medical interventions.
4. Cost-conscious individuals or insurers: The costs associated with early detection methods such as mammograms or genetic testing can be a barrier for some individuals or insurers. They may argue that the expenses of these procedures outweigh the potential benefits, especially if they believe that the risk factors for breast cancer are low. Concerns about the financial burden of widespread screening programs could lead to opposition or skepticism towards the topic statements.
5. False negative or false positive experiences: Some individuals may have personal experiences or know someone who had a false negative (missed cancer) or false positive (misdiagnosed with cancer) result from breast cancer screening. These experiences can lead to doubts or opposition to the effectiveness or reliability of early detection methods. They may believe that the potential harm and anxiety caused by false results outweigh the benefits of early detection.

Innovations

1. Advanced imaging technologies for early detection of breast cancer, such as 3D mammography or MRI-guided biopsies.
2. Genetic testing services to identify individuals at higher risk for breast cancer, enabling personalized screening and prevention strategies.
3. Development of targeted therapies and immunotherapies for more effective and less toxic treatment options.
4. Introduction of mobile mammography vans or telemedicine solutions to improve access to screening for underserved populations.
5. Implementation of artificial intelligence algorithms to assist radiologists in detecting and analyzing breast abnormalities for faster and more accurate diagnoses.
6. Introduction of innovative and less invasive surgical techniques, such as minimally invasive lumpectomies or sentinel lymph node biopsies.
7. Integration of patient decision aids and shared decision-making tools during breast cancer screening and treatment discussions.
8. Establishment of survivorship programs offering comprehensive care plans, psychosocial support, and survivorship clinics to improve overall patient outcomes.
9. Implementation of national or regional breast cancer screening programs to ensure equal access and quality of care for all individuals.
10. Development of personalized risk assessment tools incorporating lifestyle factors, genetics, and environmental factors to guide breast cancer prevention strategies.

Table 8: The final set of questions and answers, after creation by Idea Coach and editing by the researcher.

	Question A: Elaborate in detail and in 15 words or less the importance of regular mammograms for women?"
A1	Detects breast cancer early when treatment is most effective.
A2	Improve chances of successful treatment and survival rates.
A3	Reduce the need for invasive and aggressive treatments.
A4	Regular screenings empower women to take control of their breast health.
	Question B: Elaborate in detail and in 15 words or less any concerns or fears regarding mammograms?"
B1	Radiation exposure may pose potential health risks, although it is usually considered minimal.
B2	Compression during mammograms can be uncomfortable or painful for some women.
B3	False positive results can lead to unnecessary anxiety, biopsies, and other invasive procedures.
B4	Cost concerns may arise for those without insurance coverage or with limited financial resources.
	Question C: Elaborate in detail and in 15 words or less Prioritize your health together. When can I expect you to schedule your mammogram?"
C1	Don't delay, book your mammogram appointment today.
C2	It's time to prioritize your health, make that mammogram appointment.
C3	Acting promptly, when will you schedule your mammogram?
C4	Take control of your health, when will you arrange your mammogram?
	Question D: Elaborate in detail and in 15 words or less the peace of mind that comes with early breast cancer detection?"
D1	Early detection allows for prompt treatment and better chances of successful recovery.
D2	Peace of mind stems from having a sense of control and actively participating in one's healthcare.
D3	Early detection offers a higher possibility of less invasive treatment and faster recovery.
D4	The peace of mind comes from knowing that one is taking proactive steps towards their health.

Table 8 shows the final set of questions and answers, edited by the researcher. In the actual study, the vignettes will comprise only answers (also called 'elements') in combinations comprising a minimum of two and a maximum of four answers, never more than one answer for a question. The questions never appear in the vignette, but rather are used only to guide the creation of the answers.

The Self-profiling Classification

Mind Genomics allows the researcher to create a set of eight questions which allow the respondent to provide more about the topic from the respondent's point of view. Table 9 shows the list of questions. Gender and age questions are asked as a matter of course in all Mind Genomics studies.

Table 9: Self profiling questions about the respondent.

What do you know about breast cancer?
1=I don't know much
2=I know a lot because I have a relative who has it
3=I know something about because I know the public media.
How do you think breast cancer will affect your personal life?
1=I have not thought about it much
2=I think I'd be stressed having cancer
3=I think it will be a huge financial burden

In addition to the self-profiling classification questions, the respondent was instructed to complete an open-ended question about their own feelings and history regarding mammograms. The

respondent completed this open-end question after having completed the Mind Genomics evaluation, and thus were 'primed.' Most respondents wrote detailed answers, an unusual occurrence in Mind Genomics studies of simpler, less emotionally tinged topics.

The Test Stimuli

Test stimuli combine answers to questions, with these answers henceforth called 'elements', and combinations called vignettes. The underlying experimental design prescribes the specific composition of each of the 24 vignettes. Each set of 24 vignettes can be analyzed in and of itself, to estimate the contribution of the elements to the response. The method of analysis is called OLS (ordinary least-squares) regression [19]. In the experimental design, each element occurs five times in 24 vignettes and absent from 19. Thus, each question contributes an element to 20 of the 24 vignettes and is absent from four of the 24 vignettes.

A key benefit of Mind Genomics is the ability to have each respondent evaluate virtually a totally unique set of vignettes, the aforementioned combinations of elements. The process to create the unique sets is called isomorphic permutation [17]. The benefit is that the researcher ends up testing many combinations, rather than testing a few combinations but many people. The happy consequence is that Mind Genomics empowers researchers to study a topic without having to have an idea of the answer ahead of time. The sheer scope of the combinations tested allow the research to 'explore' the unknown rather than having to 'confirm' one's hypothesis.

We can contrast the Mind Genomics approach with the way typical research is conducted in the hypothetico-deductive system. Typical research studies aim to understand nature. Reducing the 'noise' around the 'signal' helps it emerge more clearly. Typically, this is done by decreasing superfluous variability, or 'noise.' In consumer research, dozens or hundreds of respondents evaluating the same vignettes is easy. Average variance, or standard error, diminishes with the square root of replicates. Four times the number of participants are needed to reduce variation around the mean by half. The above technique works when the researcher already 'knows' the right vignettes or elements, with the research ending up confirming hypotheses rather than discovering new realities. Mind Genomics focus on these new realities.

One reaction to the Mind Genomics experience is frustration, especially among professionals, far less so among non-professionals with no 'ego'. Because there is no order or consistency, professionals and beginners alike think these pairings are random. The number of elements in a vignette varies, confusing those who try to outsmart the system. Many Mind Genomics research participants feel like they are guessing because they cannot see a pattern but 'soldier on', generally just doing what they have been instructed to do. These respondents participate in a state of relaxation and what might seem to be a lack of involvement, that seeming indifference actually being a good thing because it allows true feelings to emerge. The situation is even more frustrating to professionals, especially consumer researchers, who stop participating in the middle of the study because they become frustrated that they cannot 'game the system.'

Respondent Orientation and Rating Scale

Every effort is made to lighten the mental 'load' of the respondent. The respondent need not read a long paragraph. All the respondent needs to know is that the topic is breast cancer. Everything else makes sense. The attitudes and judgments come from the respondent as she reads the vignette.

When presented with the vignettes, most respondents do not know what to do, since the vignettes are simply lists of phrases. The design of the vignette in that way is deliberate, making it easy for the respondent to 'graze' through the vignette and immediately give a rating. There is no effort made to fill the spaces between the elements with connective words, an effort which often backfires because the vignette goes from sparse, easy to scan, to dense, weighty, and simply obstructively boring.

Table 10 shows the very short orientation and the five scale values. The scale has two dimensions. The analysis uses newly created variables, each of which has only two values, '0' to denote 'no' and '100' to denote yes. That is, the responses 1-5 are transformed according to specific rules listed at the bottom half of Table 10. After creating these new binary variables, the Mind Genomics program adds a vanishingly small random number ($<10^{-4}$) to ensure some minimal variability, a prophylactic step ensuring the variability necessary for subsequent creation of equations or 'models' using OLS (ordinary least-squares).

Creating the Database for Analysis

The previous stages established an analysis-ready database. The Mind Genomics program delivers test vignettes and gathers 5-point ratings and response time, the number of seconds elapsing between stimulus presentation and rating. After responding to the current vignette, the program automatically proceeds to the next one. Figure 2 shows a screen shot of the database returned automatically to the researcher in an Excel booklet after the Mind Genomics study has been completed and the result automatically analyzed. The first set of columns shows information about the respondent. The second set of columns shows information about the structure of the vignettes. The third set of columns shows the rating information and some of the transformed data. The last column shows the open-ended questions.

Table 10: The rating question, the two-dimensional scale, and the binary transformation.

Please read these paragraphs about breast cancer and give your first impression 1=Does not motivate me...And...don't feel emotional reaction 2=Does not motivate me...But feel strong emotional reaction 3=Don't know 4=Motivates me...But...feel no emotional reaction 5=Motivates me... And...Feel strong emotional reaction Binary transformations to create new 'dependent variables' in the regression analysis. R5 = Motivates me and I feel strong emotion reaction ... 100 for rating of 5, 0 for ratings of 1,2,3, and 4 R54 = Motivates ... 100 for ratings of 5 and 4, 0 for ratings of 1,2,and 3 R52 = Feel strong emotion reaction ... 100 for ratings of 5 and 2, 0 for ratings of 1,3, and 4 R41 = No emotional reaction ... 100 for ratings of 4 and 1, 0 for ratings of 2,3, and 5 R21 = Does not motivate ... 100 for ratings of 2 and 1, 0 for ratings of 3,4, and 5
--

Figure 2: Example of the first vignette evaluated by 10 respondents, with some of the transformations already created.

Panelist	Gender	Age	AgeGroup	Quart1	Quart2	TWO MS	THREEMS	TestOrder	A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4	D1	D2	D3	D4	Top Binary Rating	Bottom Binary	RTSeconds	Open		
1	2	43	4	2	3	2	2	1	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	4	100	0	9	Breast cancer is very concerning for my family and I seeing as how it's been hereditary on my Mother's side and both her and her sister have passed from it. We constantly make sure to get screened and to keep up with blood work and doctor's appointments.	
2	2	43	4	1	2	1	1	1	0	0	0	1	0	0	1	0	0	1	0	0	0	0	1	0	0	5	100	1	2	I think it's really bad and you stay sick all the time never feel good at all I really don't know much bout breast cancer but I have multiple Myeloma cancer and I'm sick all the time I really hate cancer honestly and I am fighting for my life
3	2	54	5	2	2	2	2	1	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	5	100	1	9	I have a friend who had breast cancer and is a survivor. She went through hell and has lived to tell about it.	
4	2	42	4	2	2	1	1	1	0	1	0	0	0	0	1	0	0	1	0	0	1	0	0	0	4	100	0	4	It scares me . My sister had it. My family has genetics of cancer all types of cancer.	
5	2	52	5	2	2	1	1	1	0	0	1	0	0	1	0	0	0	0	0	1	0	0	0	1	4	100	1	2	I feel I haven't monitor my breasts. I do self exams and mamnograms	
6	2	67	7	3	2	1	1	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	0	5	100	0	7	No family members have had breast cancer but I know it's one of the common cancers that woman get every year	
7	2	42	4	1	1	2	3	1	0	0	0	1	0	0	0	1	0	1	0	0	0	0	1	0	3	0	0	2	its scary my grandmother passed from it	
8	2	43	4	2	2	2	2	1	0	0	0	1	0	0	0	1	0	1	0	0	0	0	0	1	5	101	0	2	My mother just recently got diagnosed. It's very scary. I know she will be a survivor. Get your boobies checked!!	
9	2	41	4	2	1	2	2	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	1	0	4	100	1	7	I don't feel an emotional connection took to breast cancer as I've been fortunate Vito have no scares. The people I know who have had breast cancer have had experiences that were not too bad as in they did not get sick. I have health troubles aside from breast cancer that I have to live with so I guess I don't worry about it. I am due for screening now however and will likely start next year.	
10	1	51	6	2	2	2	3	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	1	0	4	100	1	8	It's a scary cancer

Creating 'Models' (equations) Which Relate the Presence/Absence of Elements to the Binary Ratings

A hallmark analysis of Mind Genomics reveals, though regression, the magnitude of 'driving power' of each element for the group of newly developed binary variables. OLS (ordinary least squares) regression is appropriate here, either for the data from each individual, or the data from a defined group. The term 'appropriate' is used because the 24 vignettes evaluated by each respondent were created through experimental design, enabling the subsequent regression analysis at the level of the individual respondent.

The OLS regression estimates the 16 parameters for this simple equation, doing so for all the newly created dependent variables (DV): $DV = k_1(A1) + k_2(A2) \dots k_{16}(D4)$

The independent variables A1-D4 take on the value '1' when the element appears in the vignette, and, in turn, take on the value '0' when the element is absent from the vignette. This coding is called 'dummy variable [20]. Nothing is known about the element except its presence or absence, hence the term 'dummy'. The equation shows the best estimation of the 16 coefficients. The coefficients themselves are easy to understand. Let us consider the dependent variable 'R54', viz., 'motivates.' A coefficient of 10, for example, means that when the element is present in the vignette, 10% of the vignettes will be rated '5' or '4'. When the coefficient is 20, two times as many vignettes will be rated 5 or 4. Thus, if we were to come upon four elements, each generating a coefficient of 25, then 100% of the vignettes with those four elements would be rated 5 or 4. Statistical analysis suggest that

coefficients around 15 are 'significant' at the 95% confidence level. Our focus is not so much on significant elements, but rather on the patterns which reveal themselves.

We can immediately identify patterns of respondent thinking from the patterns of the strong performing coefficients. In ordinary research these patterns would go undetected because the test stimuli have no 'cognitive richness.' Thus, the researcher would have to search deeply to find a story behind the pattern. The situation is easier in Mind Genomics because the text of each element has meaning so that the results become easier to interpret. A 'story' ends up emerging more readily.

Table 11 shows the pattern of coefficients for the binary variables developed in Table 10, and for response time. The form of the equation is always the same, as described above. No equation has an additive constant or 'intercept', simply because the intercept adds a complicating parameter which prevents the coefficients from being compared directly in terms of both magnitude and real meaning. The elements in Table 11 are sorted by the coefficient for R54 (motivates), the key dependent variable.

The strong performing elements are shaded.

1. Response time (RT)-In most Mind Genomics studies the respondents rush through the study, with many elements almost skipped over, since they have RT coefficients of 0.2 to 0.5. Not so with mammography. It is worth noting that the respondent stopped to read and think about virtually all of the elements, since many elements have coefficients of 1.3 or higher for RT. These 101 respondents focused on the messages.

Table 11: Coefficients for the total panel, for response time (RT) and for five binary variables.

Coefficients for the Total Panel							
	Motivates		Yes			No	?
	I feel an emotional reaction			Yes	No		?
	Total Panel	RT	R54	R52	R41	R21	R3
B1	Radiation exposure may pose potential health risks, although it is usually considered minimal.	1.7	23	15	14	6	3
B2	Compression during mammograms can be uncomfortable or painful for some women.	1.4	23	17	12	6	2
B4	Cost concerns may arise for those without insurance coverage or with limited financial resources.	1.7	22	16	11	5	4
C1	Don't delay, book your mammogram appointment today.	1.2	22	15	11	4	4
C2	It's time to prioritize your health, make that mammogram appointment.	1.2	22	11	16	4	3
A2	Improve chances of successful treatment and survival rates.	1.1	21	11	11	2	5
A4	Regular screenings empower women to take control of their breast health.	1.2	21	13	10	2	7
B3	False positive results can lead to unnecessary anxiety, biopsies, and other invasive procedures.	1.8	21	15	11	6	5
C3	Acting promptly, when will you schedule your mammogram?	1.3	21	16	10	4	5
A1	Detects breast cancer early when treatment is most effective.	1.2	20	16	9	5	5
A3	Reduce the need for invasive and aggressive treatments.	1.3	20	13	11	4	4
C4	Take control of your health, when will you arrange your mammogram?	1.3	20	12	12	4	5
D1	Early detection allows for prompt treatment and better chances of successful recovery.	1.4	18	14	10	6	4
D4	The peace of mind comes from knowing that one is taking proactive steps towards their health.	1.5	18	15	7	4	5
D2	Peace of mind stems from having a sense of control and actively participating in one's healthcare.	1.1	16	18	4	5	4
D3	Early detection offers a higher possibility of less invasive treatment and faster recovery.	1.2	15	15	6	6	5

- Motivates me (R54). The convention for Mind Genomics studies is to shade coefficients of magnitude 21 or higher. Once again the results are startling. Nine of the 16 elements have coefficients of 21 or higher, a 'first' in Mind Genomics, and a signal that the topic is exceptionally important. Despite the strong performance of the elements, however, there is no apparent pattern in terms of what makes an element perform strongly.
- Emotional reaction (R52) also shows many strong performing elements, but again no clear patterns.
- The binary variable, R41 (no emotional reaction) shows one moderate performing element. The one which may not drive an emotional reaction is C2 (*It's time to prioritize your health make that mammogram appointment*). There is no clear story for binary variable R41.
- The binary variable R21 (does not motivate) show no elements which fail to motivate.
- The binary variable R3 (don't know) shows no strong performing elements.

If we were to sum up the results, we would conclude that the elements hold the attention of the respondent, motivate quite strongly, drive an emotional reaction. We also should conclude that there is no clear pattern.

One of the benefits of Mind Genomics is the ability for AI to summarize the patterns among the strong performing elements, much as AI does when creating the Question Book at the set-up of the

project. Table 12 shows the AI summarization based upon the results from the total panel.

The next level of analysis in the search for meaningful patterns focuses on the respondent's age. Table 13 shows a richer pattern of results, focusing only on R54, Motivates. There are many coefficients which exceed the cut-off value of 21, and thus the pattern is still elusive. The 21 respondents age 65+ show the lowest values for the coefficients.

Recall that at the start of the Mind Genomics experiment, the respondent was asked to select answers to two questions, one asking about knowledge about breast cancer, and the other asking about how breast cancer would affect her life. Table 14 shows the remarkable effects of knowing about breast cancer and expectations about life with breast cancer. The patterns across groups become quite clear. For those who either do not know about breast cancer or who have not thought about it, the elements are moderate, but most do not reach the threshold of 21 to be shaded. One group in particular deserves a note. That group of respondents comprises those who when asked about their knowledge of breast cancer selected the answer: *I know a lot because I have a relative who has it*. They ended up saying that they are strongly motivated by all of the elements except the last set, about peace of mind from early detection. That pattern makes a great deal of sense and is not immediately intuitive. This group has gone beyond peace of mind into the personal angsts accompanying experience with breast cancer, whether breast cancer has struck oneself or a family member, or friend.

Table 12: The summarization of performance of strong element(s) for the Total Panel by AI embedded in www.BimiLeap.com, the Mind Genomics platform.

<p>Overall - Panel</p> <p>The following is a description of attributes from the total sample of a research study. Interested in: Improve chances of successful treatment and survival rates.; Regular screenings empower women to take control of their breast health.; Radiation exposure may pose potential health risks, although it is usually considered minimal.; Compression during mammograms can be uncomfortable or painful for some women.; False positive results can lead to unnecessary anxiety, biopsies, and other invasive procedures.; Cost concerns may arise for those without insurance coverage or with limited financial resources.; Don't delay, book your mammogram appointment today.; It's time to prioritize your health, make that mammogram appointment.; Acting promptly, when will you schedule your mammogram?;</p> <p>Create a label for this segment: "Motivated and Informed Women seeking Improvements in Breast Health"</p> <p>Describe this segment: This segment consists of individuals who are interested in improving their chances of successful treatment and survival rates for breast health issues. They are aware that regular screenings are important for taking control of their breast health. They are informed about the potential health risks of radiation exposure, although they generally perceive it to be minimal. However, they acknowledge that compression during mammograms can be uncomfortable or painful. They are also aware of the possibility of false positive results leading to unnecessary anxiety and invasive procedures. Cost concerns may be a factor for those without insurance coverage or limited financial resources. The segment is encouraged to prioritize their health and book a mammogram appointment promptly.</p> <p>Describe the attractiveness of this segment as a target audience: This segment can be considered an attractive target audience for a mammogram promotion campaign. The focus on improving chances of successful treatment and survival rates appeals to individuals who prioritize their health and have a proactive approach towards managing their well-being. The statement about regular screenings empowering women to take control of their breast health highlights the importance of early detection and prevention, which is likely to resonate with individuals who value being proactive and taking preventative measures.</p> <p>Additionally, the mention of potential health risks from radiation exposure addresses the concerns of individuals who prioritize their safety and seek accurate information before undergoing medical procedures. The acknowledgment that compression during mammograms can be uncomfortable or painful for some women shows that the campaign is sensitive to the potential discomfort associated with the procedure, which can make it more appealing to individuals who may feel apprehensive about undergoing the screening.</p> <p>The mention of false positive results creating unnecessary anxiety and the potential for invasive procedures acknowledges the emotional and physical toll that such outcomes can have on individuals. This may appeal to those who prioritize their emotional well-being and wish to minimize unnecessary interventions.</p> <p>The mention of cost concerns for individuals without insurance coverage or limited financial resources recognizes the potential barriers to accessing mammograms for some individuals, making it more relatable and inclusive. By addressing the financial aspect, the campaign may be more attractive to individuals looking for affordable healthcare options.</p> <p>The use of persuasive language such as "Don't delay, book your mammogram appointment today" and "It's time to prioritize your health, make that mammogram appointment" appeals to individuals who respond well to urgency and a call to action. The prompt to act promptly in scheduling a mammogram may engage individuals who appreciate timely reminders and reminders to prioritize their health.</p> <p>Overall, this segment can be considered attractive as a target audience for a mammogram promotion campaign due to their focus on proactive health management, safety concerns, emotional well-being, financial considerations, and responsiveness to persuasive messaging.</p> <p>Explain why this segment might not be attractive as a target audience: This segment might not be attractive as a target audience because they may already be aware of the importance of regular screenings for breast health and the potential benefits of early detection for successful treatment and survival rates. They may already be proactive in scheduling their mammogram appointments and taking control of their health. Additionally, this segment may not be concerned about the discomfort or potential risks associated with mammograms, and they may have insurance coverage or sufficient financial resources to afford the costs. Therefore, targeting this segment with messages urging them to prioritize their health and schedule a mammogram appointment may not be effective as they are likely already taking the necessary steps for breast health.</p> <p>List what is missing or should be known about this segment, in question form:</p> <ol style="list-style-type: none">1. What are the current success rates for breast cancer treatment and survival?2. Are regular screenings proven to improve chances of successful treatment and survival rates?3. How frequent should mammograms be performed for optimal results?4. What are the potential long-term health risks associated with radiation exposure during mammograms?5. How can the discomfort or pain experienced during compression during mammograms be minimized?6. What are the specific rates of false positive results and their impact on unnecessary anxiety and invasive procedures?7. How much does a mammogram typically cost for those without insurance coverage or limited financial resources?8. Are there any alternative screening methods available that are less expensive or less uncomfortable?9. What are the recommended actions for individuals with limited financial resources who cannot afford mammograms?10. Are there any appointment scheduling challenges or wait times to consider when booking a mammogram? <p>List and briefly describe attractive new or innovative products, services, experiences, or policies for this segment:</p> <ol style="list-style-type: none">1. Mobile Mammography Units: These are specially designed vehicles equipped with mammography equipment that can travel to remote or underserved areas. This innovation brings mammogram services closer to women who lack access to healthcare facilities.2. 3D Mammography: This advanced technology provides a more detailed and accurate image of breast tissue, improving the chances of detecting cancer early. It reduces false-positive results and enhances treatment efficacy, offering women peace of mind and reducing unnecessary anxiety.3. Personalized Breast Cancer Risk Assessments: Innovative algorithms and genetic testing can provide women with personalized assessments of their risk for developing breast cancer. This empowers individuals to take proactive measures such as lifestyle changes or increased screening frequency.4. Virtual Mammography Consultations: With the advancements in telemedicine, virtual consultations with radiologists can be conducted remotely. This saves time and costs associated with traveling for appointments, making it more convenient for women to discuss their results and concerns with healthcare professionals.5. Financial Assistance Programs: Organizations and healthcare providers can introduce programs that offer financial support to women who cannot afford mammogram screenings. These initiatives can help alleviate the cost concerns faced by those without insurance coverage or limited financial resources.

- 6. Comfortable Mammography Devices: Researchers and manufacturers can focus on developing new mammography machines that provide a more comfortable experience for women. This can include features such as improved padding and adjustable compression levels, reducing discomfort or pain during the procedure.
- 7. Mammogram Appointment Reminders: Innovative apps or digital platforms can be developed to send automated reminders and schedule appointments for women due for their mammogram screenings. This can encourage timely action and improve adherence to regular screenings.
- 8. Patient Education Programs: Effective educational initiatives can be implemented to raise awareness about the importance of mammograms and address common concerns or misconceptions. These programs can empower women to take control of their breast health and eliminate any barriers to seeking timely screenings.
- 9. Mammography Support Groups: Creating support groups for women who undergo mammograms can provide emotional support, share experiences, and offer guidance to deal with anxiety or fear associated with screenings. This can help alleviate the stress caused by false-positive results or invasive procedures.
- 10. Mammogram Accessibility: Improving the accessibility of mammography services by increasing the number of screening centers or extending operating hours can help overcome logistical barriers for women with busy schedules or limited transportation options.

Which messages will interest this segment?

The messages that will likely interest this segment are:

- Improve chances of successful treatment and survival rates.
- Regular screenings empower women to take control of their breast health.
- Radiation exposure may pose potential health risks, although it is usually considered minimal.
- Compression during mammograms can be uncomfortable or painful for some women.
- False positive results can lead to unnecessary anxiety, biopsies, and other invasive procedures.
- Cost concerns may arise for those without insurance coverage or with limited financial resources.

Table 13: Strong performing elements for Total Panel and four subgroups defined by the respondent’s age.

	Coefficients for R54 (Motivates)	Total	35-44	45-54	55-64	65+
Base Size		101	14	41	25	21
Question A: Elaborate in detail and in 15 words or less the importance of regular mammograms for women?"						
A1	Detects breast cancer early when treatment is most effective.	20	13	20	24	20
A2	Improve chances of successful treatment and survival rates.	21	20	21	23	21
A3	Reduce the need for invasive and aggressive treatments.	20	16	26	22	10
A4	Regular screenings empower women to take control of their breast health.	21	17	22	23	17
Question B: Elaborate in detail and in 15 words or less any concerns or fears regarding mammograms?"						
B1	Radiation exposure may pose potential health risks, although it is usually considered minimal.	23	29	25	21	20
B2	Compression during mammograms can be uncomfortable or painful for some women.	23	28	25	21	19
B3	False positive results can lead to unnecessary anxiety, biopsies, and other invasive procedures.	21	27	24	12	21
B4	Cost concerns may arise for those without insurance coverage or with limited financial resources.	22	24	24	21	16
Question C: Elaborate in detail and in 15 words or less Prioritize your health together. When can I expect you to schedule your mammogram?"						
C1	Don't delay, book your mammogram appointment today.	22	21	23	28	15
C2	It's time to prioritize your health, make that mammogram appointment.	22	23	22	33	9
C3	Acting promptly, when will you schedule your mammogram?	21	26	16	32	16
C4	Take control of your health, when will you arrange your mammogram?	20	26	16	30	11
Question D: Elaborate in detail and in 15 words or less the peace of mind that comes with early breast cancer detection?"						
D1	Early detection allows for prompt treatment and better chances of successful recovery.	18	23	15	19	20
D2	Peace of mind stems from having a sense of control and actively participating in one's healthcare.	16	20	14	20	14
D3	Early detection offers a higher possibility of less invasive treatment and faster recovery.	15	15	14	14	19
D4	The peace of mind comes from knowing that one is taking proactive steps towards their health.	18	22	18	19	12

Focusing Opportunities by Uncovering Mind-sets

Mind Genomics searches for intuitively obvious patterns of coefficients. Without dancing around the data, spinning theories, and creating stories, the researcher should be struck by ‘ocular trauma’—that is, the patterns should ‘hit one squarely between the eyes.’

The coefficients for the different subgroups identified through the

self-profiling classification may be strongly positive, but there are no clear patterns. Tables 13 and 14 simply fail to reveal a pattern. One might strain to develop a credible explanation, but that goes against the worldview embodied in the phrase ‘ocular trauma.’ Hypotheses and stories of what may be happening do not constitute science, but simply conjectures. We need a quantitative method which advances our thinking.

Table 14: Strong performing elements for Total Panel and two sets of subgroups, defined by knowledge of breast cancer, and by selected reactions to the prospect of coming down with breast cancer.

	Group (Binary Ratings)	Total	What do you know about breast cancer			How do you think breast cancer will affect your personal life		
			I don't know much	I know a lot because I have a relative who has it.	I know something about because I know the public media.	I have not thought about it much	I think I'd be stressed having cancer	I think it will be a huge financial burden
	Base Size	101	19	38	44	28	48	25
Question A: Elaborate in detail and in 15 words or less the importance of regular mammograms for women?"								
A1	Detects breast cancer early when treatment is most effective.	20	13	23	21	11	25	24
A2	Improve chances of successful treatment and survival rates.	21	23	22	19	18	24	21
A3	Reduce the need for invasive and aggressive treatments.	20	18	25	16	12	21	29
A4	Regular screenings empower women to take control of their breast health.	21	13	25	19	11	26	22
Question B: Elaborate in detail and in 15 words or less any concerns or fears regarding mammograms?"								
B1	Radiation exposure may pose potential health risks, although it is usually considered minimal.	23	15	28	24	17	24	29
B2	Compression during mammograms can be uncomfortable or painful for some women.	23	17	26	23	18	23	27
B3	False positive results can lead to unnecessary anxiety, biopsies, and other invasive procedures.	21	14	21	24	17	22	23
B4	Cost concerns may arise for those without insurance coverage or with limited financial resources.	22	15	25	22	16	23	27
Question C: Elaborate in detail and in 15 words or less Prioritize your health together. When can I expect you to schedule your mammogram?"								
C1	Don't delay, book your mammogram appointment today.	22	19	28	19	16	26	21
C2	It's time to prioritize your health, make that mammogram appointment.	22	22	26	19	18	24	25
C3	Acting promptly, when will you schedule your mammogram?	21	22	23	20	15	25	22
C4	Take control of your health, when will you arrange your mammogram?	20	21	22	17	17	20	24
Question D: Elaborate in detail and in 15 words or less the peace of mind that comes with early breast cancer detection?"								
D1	Early detection allows for prompt treatment and better chances of successful recovery.	18	9	11	28	10	21	21
D2	Peace of mind stems from having a sense of control and actively participating in one's healthcare.	16	13	12	22	10	21	15
D3	Early detection offers a higher possibility of less invasive treatment and faster recovery.	15	10	11	21	8	18	17
D4	The peace of mind comes from knowing that one is taking proactive steps towards their health.	18	10	15	23	14	19	18

The answer to the issue of 'ocular trauma' and 'self-evident patterns' may emerge from a well-accepted class of statistical procedure known as 'clustering'. Clustering methods sort items into mutually exclusive, exhaustive groups using mathematical criteria. The researcher specifies the number of groups, intragroup coherence, and intergroup distance, and calculation follows. The researcher names the groups (interpretability) after the exercise.

Numerous statistical methods have been developed to cluster objects. The approach currently used by Mind Genomics is known as k-means clustering [21]. The objects are our 101 female respondents, each of whom generates 16 coefficients for R54, 'motivates'. The individual-level modeling is valid for these data because each respondent evaluated a unique set of 24 vignettes laid out by experimental design, and because the newly created binary variables, such as R54, were guaranteed to exhibit some minimal level of variable by the prophylactic addition of a vanishingly small random number.

K-means clustering calculates the "distance" between each pair of people (1-Pearson Correlation). The strength of the linear relation relationship between two comparable data points is shown by the Pearson Correlation. Two study respondents are separated by zero

distance (1-1 = 0) when the Pearson Correlation is 1. Two study respondents are separated by the maximum distance (1--1 = 2) when the Pearson Correlation is -1, and the patterns of coefficients go in opposite directions.

Table 15 shows the coefficients for the two-cluster solution. These clusters are called 'mind-sets' in the language of Mind Genomics. They are more readily interpretable. Mind-Set 1 is clearly most strongly motivated by the appeal to taking control of one's health. Mind-Set 2 is clearly more strongly motivated by information, by knowing the benefits and negatives of regular mammograms.

Table 16A shows the full set of coefficients for Mind-Set 1, Take control of your health through mammograms. These are the set of newly created binary dependent variables. Table 16B shows the same full set of coefficients for Mind Set 2, Benefit and negatives of mammograms Tables 16A and 16B show shaded cells for Response Times of 1.6 seconds or longer, highlighting those elements which engage attention. For R54 (Motivates) the elements which motivate are also highlighted, with values of 21 or higher. Finally for other rating variables, the threshold level has been lowered to 16+. Elements with '0' or negative coefficients are presented with a blank cell.

Table 15: Strong performing elements for Total Panel and the two emergent mind-sets (MS 1 and MS 2). The labels are assigned by the researcher.. All coefficients of 21 or higher are shown in shaded cells. The equations are estimated without an additive constant (viz., forced through the origin).

		Total	MS 1 of 2	MS 2 of 2
	Base (number of respondents in this group)	101	48	53
	Mind-Set 1 – Take control of your health through mammograms			
A1	Detects breast cancer early when treatment is most effective.	20	27	14
C1	Don't delay, book your mammogram appointment today.	22	26	19
C2	It's time to prioritize your health, make that mammogram appointment.	22	26	18
A3	Reduce the need for invasive and aggressive treatments.	20	25	16
A4	Regular screenings empower women to take control of their breast health.	21	25	18
B1	Radiation exposure may pose potential health risks, although it is usually considered minimal.	23	25	23
C4	Take control of your health, when will you arrange your mammogram?	20	23	17
A2	Improve chances of successful treatment and survival rates.	21	22	20
	Mind-Set 2 -Benefits and negatives of mammograms			
B2	Compression during mammograms can be uncomfortable or painful for some women.	23	19	26
D1	Early detection allows for prompt treatment and better chances of successful recovery.	18	9	26
D2	Peace of mind stems from having a sense of control and actively participating in one's healthcare.	16	6	26
D3	Early detection offers a higher possibility of less invasive treatment and faster recovery.	15	4	26
D4	The peace of mind comes from knowing that one is taking proactive steps towards their health.	18	11	25
B3	False positive results can lead to unnecessary anxiety, biopsies, and other invasive procedures.	21	18	24
B4	Cost concerns may arise for those without insurance coverage or with limited financial resources.	22	20	23
B1	Radiation exposure may pose potential health risks, although it is usually considered minimal.	23	25	23
C3	Acting promptly, when will you schedule your mammogram?	21	20	22

Table 16A: Coefficients for key dependent variables for Mind-Set 1 – Take control of your health through mammograms.

Mind-Set 1 – Take control of your health through mammograms							
			Yes		No	?	
	Motivates			Yes	No	?	
	I have an emotional reaction						
		RT	R54	R52	R41	R21	R3
A1	Detects breast cancer early when treatment is most effective.	1.2	27	20	10	3	1
C1	Don't delay, book your mammogram appointment today.	1.6	26	17	13	4	3
C2	It's time to prioritize your health, make that mammogram appointment.	1.4	26	11	19	4	
A3	Reduce the need for invasive and aggressive treatments.	1.1	25	15	11	1	1
B1	Radiation exposure may pose potential health risks, although it is usually considered minimal.	1.6	25	18	11	5	3
A4	Regular screenings empower women to take control of their breast health.	1.2	24	15	10	1	4
C4	Take control of your health, when will you arrange your mammogram?	1.7	23	16	12	4	5
A2	Improve chances of successful treatment and survival rates.	1.2	22	12	12	2	4
C3	Acting promptly, when will you schedule your mammogram?	1.4	21	14	11	5	6
B2	Compression during mammograms can be uncomfortable or painful for some women.	1.2	20	18	7	6	2
B4	Cost concerns may arise for those without insurance coverage or with limited financial resources.	1.8	20	15	10	5	5
B3	False positive results can lead to unnecessary anxiety, biopsies, and other invasive procedures.	1.5	18	17	6	5	6
D4	The peace of mind comes from knowing that one is taking proactive steps towards their health.	1.5	11	14	2	6	11
D1	Early detection allows for prompt treatment and better chances of successful recovery.	1.6	10	13	4	8	11
D2	Peace of mind stems from having a sense of control and actively participating in one's healthcare.	1.4	6	17		9	10
D3	Early detection offers a higher possibility of less invasive treatment and faster recovery.	1.3	4	12	1	9	12

Table 16B: Coefficients for key dependent variables for Mind-Set 2 – Benefits and negatives of mammograms.

Mind-Set 2 – Benefits and negatives of mammograms							
Motivates			Yes			No	?
I have an emotional reaction				Yes	No		?
		RT	R54	R52	R41	R21	R3
A1	Detects breast cancer early when treatment is most effective.	1.3	14	12	8	6	8
A2	Improve chances of successful treatment and survival rates.	1.0	20	11	11	2	6
A3	Reduce the need for invasive and aggressive treatments.	1.5	16	11	11	6	7
A4	Regular screenings empower women to take control of their breast health.	1.1	17	11	9	3	9
B1	Radiation exposure may pose potential health risks, although it is usually considered minimal.	1.9	22	12	17	6	3
B2	Compression during mammograms can be uncomfortable or painful for some women.	1.6	26	15	16	5	1
B3	False positive results can lead to unnecessary anxiety, biopsies, and other invasive procedures.	2.0	23	14	16	6	4
B4	Cost concerns may arise for those without insurance coverage or with limited financial resources.	1.6	23	16	12	4	3
C1	Don't delay, book your mammogram appointment today.	0.8	18	13	9	4	5
C2	It's time to prioritize your health, make that mammogram appointment.	1.0	18	10	12	4	7
C3	Acting promptly, when will you schedule your mammogram?	1.2	22	17	9	4	5
C4	Take control of your health, when will you arrange your mammogram?	1.0	17	8	13	4	6
D1	Early detection allows for prompt treatment and better chances of successful recovery.	1.3	26	15	14	4	
D2	Peace of mind stems from having a sense of control and actively participating in one's healthcare.	0.8	26	19	9	2	
D3	Early detection offers a higher possibility of less invasive treatment and faster recovery.	1.2	25	18	11	4	
D4	The peace of mind comes from knowing that one is taking proactive steps towards their health.	1.4	24	15	12	3	

Table 17: The IDT (index of divergent thought) for the mammogram study, based upon the coefficients for R54 (motivates).

IDT (Index of Divergent Thought) for R54 (Convinces)	Total	MS 1 of 2	MS 2 of 2	MS 1 of 3	MS 2 of 3	MS 3 of 3
Sum Total of Squares of All Positive Coefficients	6603	6708	7597	8018	8122	5984
Average of All Positive Coefficients (sum coefficients/base)	65	140	143	236	239	181
Number of respondents in the column (in the subgroup)	101	48	53	34	34	33
Weight = Proportion of the respondents in the subgroup	0.33	0.16	0.17	0.11	0.11	0.11
Weighted Total (Weight x Sum Total of Squares of All Positive Coefficients)	2179	1073	1291	882	893	658
Final Score = sum of weighted total	6977					
IDT = square root of Final Score	84					

Measuring the Performance of the Research Results Using the IDT (Index of Divergent Thought)

One of the critiques levelled against Mind Genomics is that the simple-to-use templated form makes the research available to anyone, and that the automated analyses done routinely after the data has been collected allows anyone to do powerful research of the type called ‘conjoint analysis’ [22]. The criticism is valid. Indeed, following the approach laid out by Mind Genomics enables a school child to do a study, and most certainly a high school student [23]. With this simplicity of process, and with the widespread available of computation, even on the smart phone, how does the world of science evaluate the contribution of the research? If the world of daily issues can be investigated with profound tools by inexperienced researchers, then can we measure the strength of the research instead of relying on the reputation of the researcher?

The answer to the foregoing can be ‘yes’ if we create an objective system to measure the strength of the research. One way to do this is the IDT, Index of Divergent Thought. The IDT uses the coefficients, or more properly the squares of the coefficients, to assess the strength of the research. Table 17 shows the computational formula. The IDT is operationally defined. For the computation of the IDT the researcher first must create the two-mind-set solution and then the three-mind-set solution, respectively, no matter which mind-set solution ends up being accepted.

Typically, novice researchers with no really strong ideas end up with IDT values around 50-60. Good research, the type with meaningful patterns, ends up with IDT values of 65-80. Really strong data, viz. studies with high coefficients, end up with IDT values of 80+, although in such cases experience suggests that all of the mind-sets respond strongly to the elements, and thus the segmentation may not

be clear. These numbers for the IDT are not engraved in stone, but rather are preliminary numbers after six months of studies addressing a variety of topics with Mind Genomics. Whether the high IDT value comes from an interesting topic or comes from powerful research is not a question that can as yet be answered.

What We have Learned-AI Summarization Elements Which ‘Motivate’ Mind-Sets 1 and 2, Respectively

A key benefit of Mind Genomics is the ability to summarize the data using the criteria defined by the researcher. Just as we were able to ‘summarize’ the different questions and answers using Idea Coach, we are now able to summarize the findings for Mind-Sets 1 and 2,

respectively Tables 18A and 18B show this summarization, based upon the dependent variable R54, motivates, and based upon the patterns and meaning generated by those elements with coefficients 21 or higher. Table 18A shows the AI summarization of the strong performing elements for Mind-Set 1. Table 18B shows the AI summarization of the strong performing elements for Mind-Set 2.

Finding Mind-sets in the Population

The Mind Genomics approach works with a relatively few number of respondents, but from those respondents uncovers mind-sets, and through the strong performing elements knows the tonality of the messages and even some of the text of the messages to which the

Table 18A: AI summarization of strong performing elements for R54 (motivates) for Mind-Set 1.

<p>AI summarization of strong performing elements for R54 (motivates)</p> <p>Mind-Set 1 – Take control of your health through mammograms</p> <p>The following is a description of attributes from the total sample of a research study. Interested in: Detects breast cancer early when treatment is most effective.; Improve chances of successful treatment and survival rates.; Reduce the need for invasive and aggressive treatments.; Regular screenings empower women to take control of their breast health.; Radiation exposure may pose potential health risks, although it is usually considered minimal.; Cost concerns may arise for those without insurance coverage or with limited financial resources.; Don't delay, book your mammogram appointment today.; It's time to prioritize your health, make that mammo-gram appointment.; Acting promptly, when will you schedule your mammogram?; Take control of your health, when will you arrange your mammogram?;</p> <p>Create a label for this segment:</p> <p>Potential Benefits and Concerns of Mammography</p> <p>Describe this segment:</p> <p>This segment consists of individuals who prioritize their health and are proactive about detecting breast cancer early. They are interested in improving their chances of successful treatment and survival rates, as well as reducing the need for invasive and aggressive treatments. Regular screenings are a crucial aspect for them, as they believe it empowers them to take control of their breast health. They may consider potential health risks associated with radiation exposure, although they usually perceive it as minimal. However, cost concerns may arise for those without insurance coverage or limited financial resources. The messaging appeals to their sense of urgency, encouraging them to book a mammogram appointment promptly and prioritize their health.</p> <p>Describe the attractiveness of this segment as a target audience:</p> <p>The segment described here could be considered attractive as a target audience for promoting mammogram appointments and breast health. This is because the attributes mentioned emphasize the benefits and importance of early detection and treatment of breast cancer. The segment highlights the potential to improve chances of successful treatment and survival rates, reduce the need for invasive treatments, and empower women to take control of their breast health through regular screenings. Additionally, the mention of radiation exposure and cost concerns indicates a consideration for potential barriers that individuals may face in accessing mammogram appointments. The use of persuasive language, such as "Don't delay," "It's time to prioritize your health," and "Take control of your health," suggests a sense of urgency and a call to action, which may be effective in motivating individuals to schedule their mammograms. Overall, this segment is attractive because it addresses the importance of early detection, potential barriers, and the need for action.</p> <p>Explain why this segment might not be attractive as a target audience:</p> <p>This segment might not be attractive as a target audience because it is too broad. The attributes listed here apply to a large portion of the population, particularly women who are at risk of developing breast cancer. It does not provide specific characteristics or demographics that would help narrow down the target audience. Additionally, the messages provided are generic and do not address any unique needs or interests of a specific group of people. Lastly, the segment does not consider any psychographic or behavioral factors that could help identify a more specific target audience.</p> <p>List what is missing or should be known about this segment, in question form:</p> <ol style="list-style-type: none">1. What specific methods or technologies are used in the early detection of breast cancer?2. How effective are the current treatments in improving survival rates?3. What are the potential risks and side effects of invasive and aggressive treatments?4. How often should women undergo regular screenings for optimal control of their breast health?5. What are the specific health risks associated with radiation exposure during mammograms?6. How much do mammogram screenings typically cost and are there any available financial assistance options for individuals without insurance or limited resources?7. How urgent is it for individuals to book a mammogram appointment and is there a recommended timeframe for scheduling?8. In what ways can individuals prioritize their health aside from scheduling a mammogram? <p>List and briefly describe attractive new or innovative products, services, experiences, or policies for this segment:</p> <ol style="list-style-type: none">1. Non-invasive and accurate breast cancer screening technologies: New imaging technologies that can detect breast cancer at an early stage with high accuracy and without the need for invasive procedures. These technologies could reduce the need for aggressive treatments and improve survival rates.2. Personalized screening schedules: Innovative services that use individual risk factors and personal health data to recommend tailored screening schedules for women. This could improve the effectiveness of screenings while minimizing unnecessary radiation exposure.3. Affordable and accessible screening options: Policies or services that address the cost concerns of individuals without insurance coverage or limited financial resources, making regular screenings more accessible to all women.4. Telemedicine for breast health consultations: Innovative telemedicine services that allow women to consult with healthcare providers remotely for breast health concerns. This could save time and reduce the barriers to seeking timely medical advice.

5. Integrative breast cancer care: New approaches that combine traditional medical treatments with complementary therapies, such as acupuncture, meditation, or nutritional support. This holistic approach could improve the overall well-being and quality of life of women undergoing breast cancer treatment.
6. Personalized survivorship programs: Innovations in survivorship programs that provide personalized care plans specific to each individual's unique physical and emotional needs after breast cancer treatment. These programs could enhance survivors' long-term well-being and support their transition back to a normal life.
7. Mobile apps for breast health monitoring: New mobile applications that empower women to track changes in their breast health, provide reminders for regular screenings, and deliver educational content on breast cancer prevention and self-examination techniques.
8. Community support networks: Innovative programs that create supportive communities for women diagnosed with breast cancer, offering emotional support, practical assistance, and access to resources. These networks could help women feel less isolated and better equipped to navigate their breast cancer journey.
9. Health insurance coverage for preventive care: Policies that ensure comprehensive health insurance coverage for preventive services, including regular screenings, genetic testing for high-risk individuals, and counseling on breast health. This could remove financial barriers and encourage more women to prioritize their breast health.
10. Public awareness campaigns: Innovative campaigns that aim to educate and raise awareness about the importance of early detection and regular screenings. These campaigns could use creative messaging and targeted strategies to motivate women to schedule their mammogram appointments.

Which messages will interest this segment?

Based on the attributes mentioned in the description, the following messages will likely interest this segment:

1. Detects breast cancer early when treatment is most effective.
2. Improve chances of successful treatment and survival rates.
3. Reduce the need for invasive and aggressive treatments.
4. Regular screenings empower women to take control of their breast health.
5. Radiation exposure may pose potential health risks, although it is usually considered minimal.
6. Cost concerns may arise for those without insurance coverage or with limited financial resources.

These messages focus on the importance of early detection, successful treatment, reducing invasive treatments, empowering women, addressing potential health risks, and considering cost concerns.

Table 18B: AI summarization of strong performing elements for R54 (motivates) for Mind-Set 2.

<p>AI summarization of strong performing elements for R54 (motivates)</p> <p>Mind-Set 2 – Benefits and negatives of mammograms</p> <p>The following is a description of attributes from the total sample of a research study. Interested in: Radiation exposure may pose potential health risks, although it is usually considered minimal.; Compression during mammograms can be uncomfortable or painful for some women.; False positive results can lead to unnecessary anxiety, biopsies, and other invasive procedures.; Cost concerns may arise for those without insurance coverage or with limited financial resources.; Acting promptly, when will you schedule your mammogram?; Early detection allows for prompt treatment and better chances of successful recovery.; Peace of mind stems from having a sense of control and actively participating in one's healthcare.; Early detection offers a higher possibility of less invasive treatment and faster recovery.; The peace of mind comes from knowing that one is taking proactive steps towards their health.;</p> <p>Create a label for this segment:</p> <p>Potential concerns and motivations for mammogram screening.</p> <p>Describe this segment:</p> <p>This segment of the research study focuses on the potential risks and concerns related to radiation exposure during mammograms, the discomfort or pain caused by compression during mammograms, the negative consequences of false positive results leading to unnecessary anxiety and invasive procedures, the financial implications of mammograms for individuals without insurance coverage or limited financial resources, the importance of acting promptly in scheduling mammograms, the benefits of early detection in terms of prompt treatment and better chances of recovery, the peace of mind and sense of control that comes from actively participating in one's healthcare, and the higher possibility of less invasive treatment and faster recovery with early detection. This segment emphasizes the importance of proactive steps towards health and highlights the various concerns, potential risks, and benefits associated with mammograms.</p> <p>Describe the attractiveness of this segment as a target audience:</p> <p>The segment described in the attributes is highly attractive as a target audience for several reasons. Firstly, the statement acknowledges the potential health risks associated with radiation exposure during mammograms, indicating that individuals in this segment are likely to be concerned about their health and well-being. This suggests that they may be more motivated to take proactive steps towards monitoring their health and seeking early detection.</p> <p>Additionally, the mention of discomfort or pain during mammograms indicates that individuals in this segment may be more willing to endure temporary discomfort in order to ensure their health is being monitored effectively. This suggests a higher level of commitment and motivation towards maintaining their well-being.</p> <p>The mention of false positive results leading to unnecessary anxiety, biopsies, and invasive procedures suggests that individuals in this segment may be highly attuned to the potential negative consequences of delayed or inaccurate diagnosis. This indicates a desire for accuracy and effective diagnosis, making them more likely to be receptive to mammogram screenings for early detection.</p> <p>Furthermore, cost concerns and the mention of insurance coverage and limited financial resources indicate that individuals in this segment may be particularly motivated to seek out affordable and accessible healthcare options. This suggests a higher likelihood of seeking out and adhering to recommended mammogram screenings.</p> <p>Overall, this segment appears to be highly attractive as a target audience as they exhibit a strong desire for proactive health management, a willingness to endure temporary discomfort for long-term well-being, a concern for accurate diagnosis and timely treatment, and a motivation to seek affordable and accessible healthcare options.</p> <p>Explain why this segment might not be attractive as a target audience:</p> <p>This segment might not be attractive as a target audience because they have concerns about radiation exposure, discomfort or pain during mammograms, false positive results leading to unnecessary procedures, and cost concerns. They may have limited financial resources or lack insurance coverage, which could make them reluctant to seek regular mammograms. Additionally, the segment values peace of mind, control over their healthcare, and proactive steps towards their health. These attributes suggest that they may be more risk-averse and may prioritize avoiding potential negative experiences and costs over the potential benefits of early detection and treatment. As a result, this segment may be less likely to respond positively to messaging or interventions that promote mammogram screenings or early detection.</p>
--

List what is missing or should be known about this segment, in question form:

1. What are the specific potential health risks associated with radiation exposure in mammograms?
2. How many women experience discomfort or pain during mammograms?
3. What is the frequency of false positive results in mammograms?
4. How often do false positive results lead to unnecessary biopsies and other invasive procedures?
5. What proportion of the total sample does not have insurance coverage or limited financial resources?
6. How do cost concerns affect the likelihood of scheduling a mammogram?
7. What factors influence the promptness of scheduling a mammogram?
8. How does early detection contribute to a higher chance of successful recovery?
9. What specific actions can individuals take to actively participate in their healthcare?
10. How does early detection in mammograms lead to less invasive treatment and faster recovery?
11. What are the proactive steps that individuals can take to improve their health, besides scheduling regular mammograms?

List and briefly describe attractive new or innovative products, services, experiences, or policies for this segment:

1. Radiation-free mammography: An attractive new product could be a mammography technology that eliminates the use of radiation. This would address the potential health risks associated with radiation exposure and provide women with peace of mind during the screening process.
2. Comfort-focused mammograms: A service that focuses on providing a comfortable and pain-free mammogram experience would be highly attractive for this segment. This could include specialized techniques, equipment, or environments designed to minimize discomfort and enhance patient satisfaction.
3. Improved accuracy through advanced imaging: Innovative policies could prioritize the implementation of advanced imaging technologies that offer higher accuracy in breast cancer detection. This would reduce false positive results, alleviating unnecessary anxiety and invasive procedures for women undergoing mammograms.
4. Affordable mammography programs: Introducing policies that ensure affordable mammography services, particularly for those without insurance coverage or limited financial resources, would address the cost concerns mentioned by the segment. This could involve subsidies, discounts, or community-based initiatives to make mammograms more accessible to all.
5. Personalized scheduling reminders: A new service that utilizes technology to send personalized reminders and schedule mammograms for individuals in a timely manner would address the prompt action desired by the segment. This could reduce the likelihood of delayed screenings and encourage early detection.
6. Supportive healthcare programs: Policies that promote comprehensive healthcare programs focused on early detection and treatment of breast cancer could greatly benefit this segment. These programs can provide emotional support, education, and resources to women, empowering them to actively participate in their healthcare and improve their chances of successful recovery.
7. Convenient telemedicine options: Offering telemedicine consultations for mammograms could provide convenience and peace of mind for women. This innovative service would allow patients to discuss their results, ask questions, and receive guidance from healthcare professionals from the comfort of their own homes.
8. Mobile mammography units: Introducing mobile mammography units that travel to underserved areas or communities could increase accessibility to mammograms for women who face barriers in accessing healthcare. This innovative approach ensures that women can conveniently access screening services, regardless of their location.
9. Patient empowerment programs: Developing programs that educate and empower women to take proactive steps towards their health would address the segment's desire for peace of mind. These programs could include self-examination training, risk assessment tools, and lifestyle guidance to encourage women to be actively involved in their breast health.
10. Less invasive treatment options: Innovative products or services that focus on less invasive treatment options for breast cancer, such as targeted therapies or minimally invasive surgeries, would appeal to this segment. Early detection enables the higher possibility of accessing these advanced treatments, promoting faster recovery and reducing the physical burden on patients.

Which messages will interest this segment?

Based on the attributes described in the total sample of the research study, the following messages are likely to interest this segment:

1. "Radiation exposure poses minimal health risks, ensuring your safety during mammograms."
2. "We prioritize your comfort during mammograms, ensuring minimal compression and pain."
3. "Our highly accurate mammograms reduce false positive results, avoiding unnecessary anxiety and invasive procedures."
4. "Affordable mammogram options available for uninsured individuals or those with limited financial resources."
5. "Schedule your mammogram promptly to prioritize early detection and increase chances of successful recovery."
6. "Take control of your health and actively participate in your healthcare, ensuring peace of mind."
7. "Early detection offers less invasive treatment options and faster recovery, providing better outcomes."
8. "Proactively taking steps towards your health provides peace of mind and a sense of control."

These messages focus on the potential health risks, comfort, accuracy, cost concerns, promptness, early detection, sense of control, and peace of mind related to mammograms and proactive healthcare.

mind-sets will respond. One cannot perform a Mind Genomics study on millions of women, however, to analyze their data, and then assign each woman to the appropriate mind-set for making appointments for a mammography. Such a capability would be wonderful, but not feasible.

To address the issue of assigning a new person to a mind-set, Moskowitz and colleagues developed the PVI, the personal viewpoint identifier. The PVI uses the data from the study, putting it into a simulator, and identifying the best set of elements and their weights in order to assign a new person to one of the two mind-sets.

The PVI system has been embedded in an easy-to-use computer program (www.PVI360.com), linked to the data from a Mind Genomics study.

Figure 3 Panel A shows the first part of the PVI, which gathers information from the respondent. It is here that one can create a registry of individuals, who give their permission to be contacted for further research.

Figure 3 Panel B shows the actual set of six questions, comprising six statements taken directly from the research study, but presented to the respondent as a set of questions with two answers.

Figure 3 Panel C shows the feedback to the researcher or to the respondent about mind-set membership given the responses.

Figure 3 Panel D shows the set-up screen that the researcher uses to transfer summary data from the Mind Genomics results to the input for the PVI. The task takes less than five minutes.

The Mind-sets Differ in the Style of Their Open-ended Responses

Traditionally, the Mind Genomics studies (really experiments) have not been 'productive' when it comes to having the response write about the topic. Most respondents are not particularly interested in the topic. This study on mammograms, and perhaps others studies on personal health, may open up an opportunity to learn more from the person, or the patient since the study deals with a topic of interest.

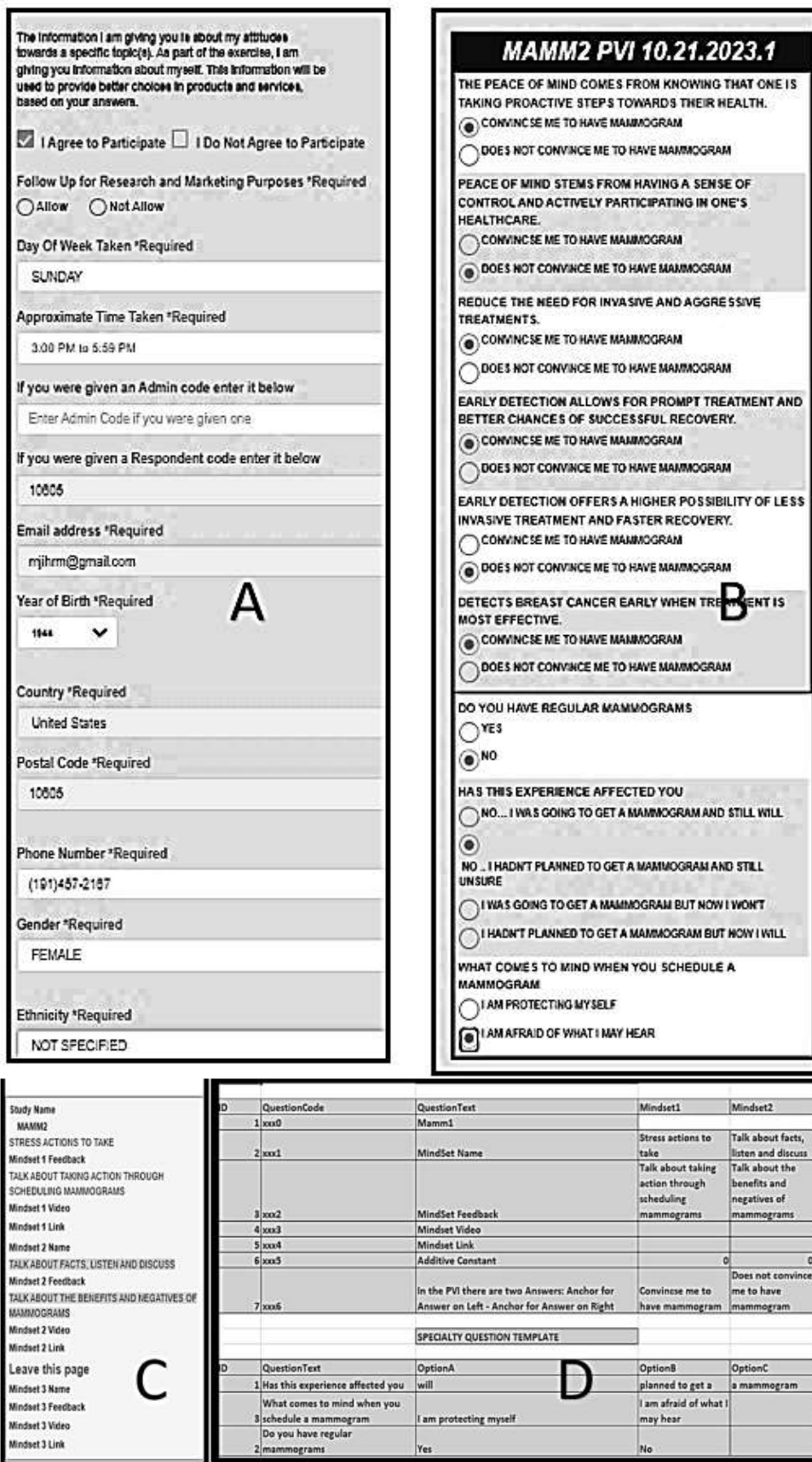


Figure 3: Panel A shows the qualification and background questions for the PVI. Panel B shows the six question PVI and additional questions about mammography asked to the respondents. Panel C shows the feedback information provided immediately by email to either the medical professional or to the respondent, or to both. Panel D shows the first part of the set-up page, done in Excel.

Table 19: AI summarization of open-end answers for Mind-Set 1 (Take control of your health) and Mind-Set 2 (Benefits and negatives of mammograms).

<p>Summary of open-end answers from Mind-Set 1 – Take control of your health</p> <p>Breast cancer is a prevalent issue in many people's lives, and early detection is crucial for its cure. However, it can be stressful and disruptive, especially for those who have experienced it firsthand. Some individuals are afraid of getting breast cancer, as they fear the loss of family members who have had it. One person is concerned about their own health and the potential negative effects of early detection. They have experienced a mammogram, which was a false positive, and have never had another exam since. They believe that early detection is essential for determining if they can be treated for early cancer. Another person is concerned about the stigma surrounding breast cancer, as it affects everyone and can lead to stigmatization and discrimination. They have experienced the emotional roller coaster of having family members who have had it, and they feel that it is important for women to keep a close eye on their health. Another person is a head and neck cancer survivor who feels strongly about all cancers but believes that segregating one type of cancer from others is not fair. They have experienced the emotional roller coaster of having their family members have had breast cancer, and they have not been good about mammograms because they are scared. In conclusion, breast cancer is a serious issue that can be detected early with proper screening and treatment. It is essential for individuals to be aware of their health and take necessary steps to prevent it. By recognizing the importance of early detection and taking proactive measures, we can work towards a more compassionate and effective society.</p> <p>Summary of open-end answers from Mind-Set 2 – Benefits and negatives of mammograms</p> <p>Mind-Set 2 Since breast cancer is genetic and my mother and sister died from it, my family and I are very concerned. We regularly have blood work, screenings, and doctor's appointments. A friend of mine survived breast cancer. She survived hell. I'm afraid my grandmother died from it. Only recently was my mother diagnosed. Very terrifying. I believe she will survive. Your boobies need checking! Due to Vito's lack of breast cancer scares, I don't feel emotional about it. I know breast cancer patients who did not become sick. Since I have other health issues, I don't worry about breast cancer. I am scheduled for screening now and may start next year. Cancer is scary. I believe breast cancer may affect everybody. We must be careful with what we eat, drink, and lifestyle.</p>

The final analysis subjected the open-end response to AI summarization through an APP 'QuillBot' [24] and requested the program to summarize the information contained in the open-end answers. No other request was made. The AI program was given the answers in the form of an excel sheet, one sheet for Mind-Set 1 (Take control of your health), the other sheet for Mind-Set 2 (Benefits and negatives of mammograms). No other information was provided.

Table 19 shows the remarkable difference in the way AI summarized the two sets of open-ended answers. The AI generated summary for Mind-Set 1, *take control of your health*, appears to be a coherent paragraph. In contrast, the AI generated summary for Mind-Set 2, *benefits and negatives of mammograms*, appears to be a set of disconnected sentences, rather than a single or small set of paragraphs. This difference in the morphological characteristics of the open-end answers may hint at important ways the different mind-sets organize information and provide new opportunities for understanding the minds of patients.

Discussion and Conclusions

This paper is based upon work originally done as a demonstration project to teach Mind Genomics. The powerful results were unexpected. Most studies using Mind Genomics end up with respondents who are only moderately interested in the topic. These studies usually deal with product features and with messaging about those features. More serious studies, such as those regarding society, law, ethics, and so forth, cannot be said to engage the respondent more deeply. The response times for these other studies are short. The coefficients for RT for these are studies are in the order of 0.3-0.7 seconds for most, suggesting little interest. Rather, it seems for the most part the respondents graze the messages, give a meaningful answer, but are not particularly involved in the Mind Genomics exercise.

The fact that topics of personal medical health produce this degree of interest suggest a rich opportunity to understand the patient at a level not before seen. One can imagine working with patients in a variety of situations, individuals who are motivated to learn about the topic, and learn about themselves at the same time. One could even

imagine larger scale initiatives, where patients could participate for 5-10 studies on the different aspects of their condition, join a 'club' and keep contributing, with follow-up visits to their doctor, and follow-up studies. Their compensation might be some consideration given to them when they get their drugs and other materials from the pharmacy, a sort of 'affinity group' to forward knowledge.

As a final thought, it is worth thinking about the role of Mind Genomics as a way to understand the world. Research has been thought of as a highly disciplined, hypothesis-based procedure done by specialists, researchers, and scientists. Research as an everyday event is rarely discussed, but our intellectual curiosity makes us researchers, whether we realize it or not. Our world exploration includes watching, asking questions, acting on them, and moving on. People learn this way. The Mind Genomics "program" brings science and careful observation to the everyday. We discuss the everyday grind. Mind Genomics practitioners, like the pioneering scientists of the past, can study the globe in hours, discovering new themes. Artificial intelligence combined with natural curiosity is the next instrument for exploring, learning, and comprehending. The science is kept, but childlike love of simplicity, a guide or mentor, quickness, low cost, and most of all learning fun is introduced. Why not an adult serious researcher engaged in important problems where people's thoughts are studied. If a nine-year-old can do the experiment and have fun, why not adults and more important, why not patients with medical conditions? The result might be a healthier world if one could discover how to have the patients comply, live a healthier lifestyle, and pass on their ideas to others through the systematization afforded by Mind Genomics.

References

1. Enaizan O, Zaidan AA, Alwi NHM, Zaidan BB, Alsalem MA, et al. (2020) Electronic medical record systems: Decision support examination framework for individual, security & privacy concerns using multi-perspective analysis. *Health and Technology* 10: 795-822.
2. Gianfrancesco MA, Tamang S, Yazdany J, Schmajak G (2018) Potential biases in machine learning algorithms using electronic health record data. *JAMA Internal Medicine* 178: 1544-1547. [crossref]
3. Li J, Shaw MJ (2012) Safeguarding the Privacy of Electronic Medical Records. In *Cyber Crime: Concepts, Methodologies, Tools and Applications*. IGI Global 891-901.

4. Gøtzsche PC, Jørgensen KJ (2013) Screening for breast cancer with mammography. *Cochrane Database of Systematic Reviews* 2013.
5. Kerlikowske K, Grady D, Rubin SM, Sandrock C, Ernster VL (1995) Efficacy of screening mammography: a meta-analysis. *JAMA* 273: 149-154. [[crossref](#)]
6. Brett J, Bankhead C, Henderson B, Austoke J (2005) The psychological impact of mammographic screening. A systematic review. *Psycho-Oncology* 14: 917-938. [[crossref](#)]
7. Bernstein J, Mutschler P, Bernstein E (2000) Keeping mammography referral appointments: motivation, health beliefs, and access barriers experienced by older minority women. *Journal of Midwifery & Women's Health* 45: 308-313. [[crossref](#)]
8. Holm CJ, Frank DI, Curtin J (1999) Health beliefs, health locus of control, and women's mammography behavior. *Cancer Nursing* 22: 149-156. [[crossref](#)]
9. Taplin SH, Barlow WE, Ludman E, MacLehos R, Meyer DM, et al. (2000) Testing reminder and motivational telephone calls to increase screening mammography: a randomized study. *Journal of the National Cancer Institute* 92: 233-242. [[crossref](#)]
10. Lawson AE (2000) The generality of hypothetico-deductive reasoning: Making scientific thinking explicit. *The American Biology Teacher* 62: 482-495.
11. Backman K, Kyngäs HA (1999) Challenges of the grounded theory approach to a novice researcher. *Nursing & health sciences* 1: 147-153. [[crossref](#)]
12. Nederhof AJ (1985) Methods of coping with social desirability bias: A review. *European Journal of Social Psychology* 15: 263-280.
13. Moskowitz HR (2012) 'Mind Genomics': The experimental, inductive science of the ordinary, and its application to aspects of food and feeding. *Physiology & Behavior* 107: 606-613. [[crossref](#)]
14. Moskowitz HR, Gofman A, Beckley J, Ashman H (2006) Founding a new science: Mind Genomics. *Journal of Sensory Studies* 21: 266-307.
15. Zemel R, Choudhuri SG, Gere A, Upreti H, Deitel Y, et al. (2019) Mind, Consumers, and Dairy: Applying Artificial Intelligence, Mind Genomics, and Predictive Viewpoint Typing. In *Current Issues and Challenges in the Dairy Industry*. Intech Open.
16. Stevens SS (1975) *Psychophysics: An Introduction to Its Perceptual, Neural and Social Prospects*, New York, John Wiley.
17. Gofman A, Moskowitz H (2010) Isomorphic permuted experimental designs and their application in conjoint analysis. *Journal of Sensory Studies* 25: 127-145.
18. Liu Y, Han T, Ma S, Zhang J, Yang, Y, et al. (2023) Summary of ChatGPT-related research and perspective towards the future of large language models. *Meta-Radiology* 100017.
19. Craven BD, Islam SM (2011) Ordinary least-squares regression. *The SAGE Dictionary of Quantitative Management Research* 224-228.
20. Hardy MA (1993) *Regression with Dummy Variables*. Sage 93.
21. Likas A, Vlassis N, Verbeek JJ (2003) The global k-means clustering algorithm. *Pattern Recognition* 36: 451-461.
22. Marshall D, Bridges JE, Hauber B, Cameron R, Donnalley L, et al. (2010) Conjoint analysis applications in health—how are studies being designed and reported? An update on current practice in the published literature between 2005 and 2008. *The Patient: Patient-Centered Outcomes Research* 3: 249-256. [[crossref](#)]
23. Kornstein B, Rappaport S, Moskowitz H (2023) Communication styles regarding child obesity: Investigation of a health and communication issue by a high school student researcher, using Mind Genomics and artificial intelligence. *Mind Genomics Studies in Psychology and Experience* 3: 1-14.
24. Fitria TN (2021) QuillBot as an online tool: Students' alternative in paraphrasing and rewriting of English writing. *Englisia: Journal of Language, Education, and Humanities* 9: 183-196.

Citation:

Baig MA, Rappaport S, Moskowitz H (2023) Motivating Mammography: Combining AI and Mind Genomics to Discover What a Patient Needs to Hear. *ARCH Women Health Care* Volume 6(4): 1-21.