MARKETING POTENTIAL OF BEHAVIORAL GENETICS IN THE CONTEXT OF HYPER-PERSONALIZATION

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Abstract: *Behavioral genetics offers valuable insights into how genetic and environmental factors shape consumer behavior, opening new possibilities for hyper-personalized marketing. By understanding how genetic markers influence traits like risk-taking, novelty-seeking, and social preferences, businesses can tailor products and services to individual needs. The integration of genomic data into marketing strategies allows for precise targeting, enhancing consumer engagement and driving sustainable consumption. However, challenges such as data privacy, replicability of research, and the complexity of gene-environment interactions remain. Future research in sociogenomics can further enhance understanding of how genetic predispositions and environmental factors interact to shape consumer behavior, providing a pathway for even more personalized and ethical marketing strategies.*

Keywords: *Behavioral Genetics, Hyper-Personalization, Consumer Behavior*

Track: *Consumer Behavior*

1. Introduction

The advent of behavioral genetics as a scientific discipline has provided valuable insights into the intricate interplay between genes and environmental factors that shape human behavior. By exploring the genetic underpinnings of personality traits, preferences, and decision-making processes, behavioral genetics offers a deeper understanding of the biological influences on consumer behavior, with significant implications for hyper-personalized marketing. This paper examines how businesses can leverage genetic insights to enhance consumer engagement and refine marketing strategies, drawing from genetic markers that influence behaviors such as risk-taking, novelty-seeking, and brand loyalty. These insights enable companies to craft personalized marketing campaigns, optimize product offerings, and predict consumer responses with greater accuracy. Additionally, the paper explores the ethical and legal considerations of incorporating genetic data into marketing strategies, addressing concerns related to privacy, consent, and discrimination. With the growing demand for tailored products in a competitive market, businesses are increasingly turning to behavioral genetics to better understand consumer preferences and create more meaningful, individualized interactions. This paper highlights how behavioral genetics can revolutionize marketing practices while ensuring responsible use of genetic data.

2. Emergence and development of the behavioral genetics as a scientific discipline

Behavioral genetics is a branch of psychology that explores the genetic foundations of human behavior, examining how hereditary factors and the environment shape individual traits (McGue & Gottesman, 2015). It studies the relationship between genotype (genetic sequences) and phenotype (observable traits), with genotype providing genetic "instructions" and phenotype reflecting visible characteristics like size, shape, and behavior (Stanford Encyclopedia of Philosophy, 2017). This distinction is key in evolutionary theory, as survival and reproduction depend on phenotype, while genotype is passed unchanged to the next generation.

Behavioral genetics emerged in the 19th century amid the nature vs. nurture debate, with Sir Francis Galton, influenced by Darwin's theory, founding the field. In 1869, Galton published *Hereditary Genius*, suggesting genetic factors shape individual achievements (Galton, 1869). Research revived in the 1970s with the formation of the Behavioral Genetics Association, highlighting intelligence as largely inherited (Erlenmeyer-Kimling & Jarvik, 1963; Bouchard & McGue, 1981). Key conclusions include: genetic influences on behavior are widespread, environmental factors impact genetic expression more than upbringing, and

genetic influences on traits increase with age (Plomin et al., 2013; McGue & Gottesman, 2015).

Classic twin studies compare the similarity of monozygotic (identical) and dizygotic (fraternal) twins, showing that genetic influences on traits are significant (McGue & Gottesman, 2015). Even when raised apart, twins exhibit psychological similarities, emphasizing the role of genetics (Bouchard et al., 1990). Genome-Wide Association Studies (GWAS) analyze the genome to identify genetic associations with behavioral traits (Visscher et al., 2012). Epigenetics also plays a role, as environmental factors can modify gene expression (Petronis, 2010).

3. Genetic Determinants of Consumer Behavior

Behavioral genetics explores how genes in nuclear DNA interact with the environment to shape human behavior. Genes produce proteins that regulate hormones such as serotonin, dopamine, and oxytocin, influencing mood, motivation, and social bonding (McGue & Gottesman, 2015). These hormones play key roles in behaviors like empathy and social interaction. Behavioral genetics is widely applied across disciplines, including psychology (Bouchard et al., 1993; Plomin et al., 2013), economics (Miller et al., 1995), and political science (Fowler et al., 2008). In organizational behavior, it informs studies on workplace satisfaction (Arvey et al., 1989) and entrepreneurship (Nicolaou et al., 2008), highlighting the genetic influence on traits like risk-taking and innovation (Küchle, 2019; Zhao & Seibert, 2006). Environmental factors can modify gene expression, affecting behavior (Petronis, 2010), a concept studied under epigenetics.

Identifying specific genes linked to behavioral traits is complex, as gene expression is influenced by many factors. For instance, the "adventure gene" affects dopamine production, which triggers novelty-seeking behavior (Ebstein et al., 1996). Behavioral genetics has revealed that while environmental factors shape behavior, genes contribute significantly, though not deterministically.

Turkheimer (2000) proposes three laws of behavioral genetics, which suggest that all human behavioral traits are heritable, family environment has less influence than genetics, and much variation in complex traits is not explained by genes or the family environment. Inheritance is never entirely non-genetic, with genetic influence varying from 0% to 50% based on genetic variation and individual attempts to alter genetic predispositions (Deaux & Snyder, 2014). A fourth law proposed by Chabris et al. (2015) explains that behavioral traits are influenced by many small genetic variants, each contributing marginally to behavior, making it challenging to isolate specific genes for complex traits. Critics argue that behavioral

genetics has limitations in defining traits and pinpointing specific genes responsible for behaviors such as texting or religious beliefs (Charney, 2016; Miller et al., 2012). Despite these challenges, genetic factors are central to understanding consumer behavior, offering insights for personalized marketing strategies (Alford et al., 2005; Fowler & Dawes, 2008).

4. Understanding Consumer Behavior through Behavioral Genetics

Behavioral genetics provides valuable insights into consumer behavior by examining how genetic factors influence individual preferences and actions. Genetic predispositions can help explain why people have different tastes, lifestyles, and purchasing habits. By identifying specific genes that influence preferences for foods or products, genetic testing enables companies to offer more personalized solutions based on consumers' genetic profiles. This integration of behavioral genetics with consumer behavior opens new opportunities for marketing strategies that are tailored to meet individual customer needs more effectively.

Consumer behavior is shaped by emotions, thoughts, actions, and environmental factors (Mowen & Minor, 2002). It involves decision-making stages: recognizing a need, gathering information, evaluating alternatives, making a purchase, and post-purchase evaluation. Each stage is influenced by personal preferences, social, cultural, and economic factors (Stoimenova et al., 2018). Psychological factors like motivation, perception, beliefs, and attitudes guide consumer choices, while social influences such as family and friends can create pressure or support. Cultural values and traditions also impact consumer behavior across societies.

A notable example of behavioral genetics shaping human traits and behavior is the case of identical twins Jim Lewis and Jim Springer. Separated at birth and raised apart, these twins exhibited remarkable similarities despite different upbringings. Both married and divorced women named Linda, remarried women named Betty, and named their sons James Alan. They shared interests in technical drawing, woodworking, and mathematics, and even had dogs named Toy. Their smoking and drinking habits, as well as health issues like high blood pressure, were strikingly similar, and both pursued law training while working as part-time deputies. Psychologist Thomas Bouchard studied the twins, revealing their shared behaviors and traits, providing strong evidence that genetics plays a significant role in shaping human behavior (Chen, 1979; Bouchard et al., 1990). This case demonstrates how genetics influences consumer behavior, suggesting that marketing strategies can be more effective when they consider genetic predispositions. By understanding these genetic patterns, marketers can design products and campaigns that align more closely with consumers' inherent behaviors, leading to more personalized and impactful experiences.

5. Marketing Potential of Behavioral Genetics in Hyper-Personalization

Reciprocal determinism suggests behavior is shaped by both biological and social factors (Fatoki, 2021). In consumer behavior, genetic factors influence preferences through biological processes governing sensory perceptions and metabolism (Chabris et al., 2015). Biomarketing integrates social and biological sciences to explore how biological processes interact with the social environment to influence decisions (Fatoki, 2021). Fatoki (2020) advocates for incorporating biological principles, like cell hyper-segmentation, into marketing, particularly in customer relationship management. Hormones like cortisol, testosterone, oxytocin, and vasopressin influence social behavior (Ellison & Gray, 2009), and specific genes regulate curiosity, novelty-seeking, and opportunity recognition (Bagozzi et al., 2011; Küchle, 2019).

The microbiome affects consumer behavior, with gut microbiota influencing brain function and behavior, especially in autism (Cenit, Sanz, & Codoñer-Franch, 2017). Probiotics and prebiotics show promise in managing autism symptoms (Krishfield et al., 2011; Kang et al., 2017), opening opportunities for microbiome-based marketing. Nutrigenomics, which examines genetics and diet interaction, offers personalized nutrition products. As genetic variations affect nutrient responses, companies can create tailored wellness plans, fostering brand loyalty (Küchle, 2019; Fatoki, 2021).

Zipf's law, the principle of least effort, applies to gene distribution and behavior, showing that preferences rely on practices requiring minimal effort (Nebel & Pezzulli, 2012). Nonlinear dynamics in consumer behavior suggest small environmental changes can cause significant shifts in purchasing behavior, similar to the "butterfly effect" in chaos theory (Gleick, 1987; Strogatz, 1994). Minor shifts in financial status or marketing messages can cause major behavioral changes. Vasileva (2015) applies Zipf-Pareto's law to brand dynamics, showing how brand values align with this law and regulatory factors influence brand growth. Understanding genetic influences and the chaotic nature of consumer decisions can improve marketing strategies.

Behavioral genetics reveals individuals have unique genomic personas shaped by genotype and environmental influences, affecting behaviors like risk-taking, novelty-seeking, and innovation (Kerry, 2013; Küchle, 2019). This allows for personalized products based on genetic markers, with applications in eco-design (Schäfer & Löwer, 2021; Ivanova-Kadiri, 2023). Integrating genomic data into customer databases can align products with consumers' preferences, fostering sustainable consumption. Challenges persist, particularly in replicating

genome-wide association study results, as genetic factors explain only part of behavioral variation, with the rest shaped by gene-environment interactions.

Drucker (2008) highlights that business success depends on creating customers, with marketing and innovation at the core. This requires a shift to sustainable business models that focus on innovation and customer-oriented strategies (Dholakia, 2009; McDonough & Prottero, 2014). Global changes and creative destruction (Schumpeter, 1950) demand new products and processes. Companies must evolve to support sustainable consumption in line with changing geopolitical realities.

Marketing strategies focused on the environment, rather than consumerism, can foster sustainable corporate ecosystems by integrating customer knowledge, innovation, and long-term planning to meet demand for eco-friendly products, while balancing value creation with the preservation of natural and human capital (Ivanova-Kadiri, 2023; Muriithi, 2022; Fuchs et al., 2022; Martin & Schouten, 2014). Genetic information aids precision medicine and public health strategies, with behavioral genetics supporting sustainable consumption (Ivanova-Kadiri, 2023). Epigenetics and nutrigenomics explore how genetic variations affect nutrient responses, particularly for autoimmune diseases (Kandeel & El-Deeb, 2022).

Personalized genomics and behavioral genetics are crucial for space travel therapies. NASA's 2019 twin astronaut experiment showed how space conditions affect gene expression and health, highlighting the need for personalized strategies to address immune dysregulation, muscle atrophy, and bone loss, with insights applicable to both space and Earth-based health (Tesei et al., 2022; Hodgkinson et al., 2017; Stepanek et al., 2019; Pavez Loriè et al., 2021).

Organizations' success depends on integrating sustainable technologies and adapting to dynamic changes. Consumer behavior, influenced by accelerating technologies (Drucker & Maciariello, 2008), must be understood for organizational growth. Genetic marketing enables precise targeting based on genetic personas (Daviet et al., 2022). As genomic science shifts to clinical applications, it becomes disruptive technology (Frizzo-Barker, 2016), raising ethical and privacy concerns that require strict regulation (Reali et al., 2018; Ivanova-Kadiri, 2023). Addressing these challenges ensures the responsible use of genetic data in marketing strategies (Kitchin & McArdle, 2016).

6. Future research

Sociogenomics, as an emerging field, holds significant potential for advancing behavioral genetics in marketing, particularly in understanding consumer behavior. By studying how social and environmental factors interact with genetic markers, sociogenomics aims to uncover how genetic variations influence social preferences, such as those related to

friends, partners, and, importantly, consumer choices (Robinson et al., 2005; Beard, 2017). Future research in this area could lead to groundbreaking insights into how environmental factors like stress, social isolation, and exposure to different social contexts can alter gene expression and influence consumer behavior. Additionally, the study of epigenetic modifications could reveal how consumers' experiences shape their preferences and decision-making processes at a genetic level. This offers a unique opportunity to develop hyper-personalized marketing strategies that consider both genetic predispositions and environmental influences, ultimately leading to more targeted, effective, and ethically responsible consumer engagement.

7. Conclusion

The potential of behavioral genetics in hyper-personalized marketing is vast, offering businesses the ability to develop more targeted, efficient strategies by integrating genetic insights with consumer data. Through advancements in genomics, including nutrigenomics and epigenetics, companies can offer customized products and services that align with consumers' genetic profiles and environmental influences. While the field is promising, challenges related to data privacy, genetic complexity, and research consistency need to be addressed. As sociogenomics evolves, it holds the potential to further enhance our understanding of consumer behavior, paving the way for even more personalized marketing approaches that respect ethical boundaries and promote sustainable consumption.

References

Alford, J. R., Funck, C. L., & Hibbing, J. R. (2005). Are political orientations genetically transmitted? A*merican Political Science Review, 99*(1), 153–167. https://doi.org/10.1017/S0003055405051256

Arvey, R. D., Bouchard, T. J., Segal, N. L., & Abraham, L. M. (1989). Job satisfaction: Environmental and genetic components. *Journal of Applied Psychology, 74*(2), 187–192. https://doi.org/10.1037/0021-9010.74.2.187

Bagozzi, R. P., Verbeke, W. J., Van den Berg, W. E., Rietdijk, W. J., Dietvorst, R. C., & Worm, L. (2011). Genetic and neurological foundations of customer orientation: Field and experimental evidence. *Journal of the Academy of Marketing Science, 40*(5), 639–658. https://doi.org/10.1007/s11747-011-0271-4

Beard, A. (2017, January-February). Your success is shaped by your genes. *Harvard Business Review*. https://hbr.org/2017/01/your-success-is-shaped-by-your-genes

Bergen, S. E., Gardner, C. O., & Kendler, K. S. (2007). Age-related changes in heritability of behavioral phenotypes over adolescence and young adulthood: A meta-analysis. *Twin Research and Human Genetics, 10*(3), 423–433. https://doi.org/10.1375/twin.10.3.423

Bouchard, T. J., Jr., & McGue, M. (1981). Familial studies of intelligence: A review. *Science, 250*, 223–238. https://doi.org/10.1126/science.2218526

Bouchard, T. J. Jr., Lykken, D. T., McGue, M., Segal, N. L., & Tellegen, A. (1990). Sources of human psychological differences: The Minnesota Study of Twins Reared Apart. *Science, 250*(4978), 223–228. https://doi.org/10.1126/science.2218526

Charney, E. (2017). Genes, behavior, and behavior genetics. *WIREs Cognitive Science, 8*(1-2). https://doi.org/10.1002/wcs.1405

Chabris, C. F., Lee, J. J., Cesarini, D., Benjamin, D. J., & Laibson, D. I. (2015). The fourth law of behavior genetics. *Current Directions in Psychological Science, 24*(4), 304–312. https://doi.org/10.1177/0963721415580430

Cenit, M. C., Sanz, Y., & Codoñer-Franch, P. (2017). Influence of gut microbiota on neuropsychiatric disorders. *World Journal of Gastroenterology, 23*(30), 5486–5498. https://doi.org/10.3748/wjg.v23.i30.5486

Deaux, K., & Snyder, M. (Eds.). (2014). *The Oxford handbook of personality and social psychology* (1st ed.). Oxford University Press. https://doi.org/10.1093/oxfordhb/9780199364121.001.0001

Dholakia, N. (2009). Marketing theory: Breaking the siege of incrementalism. *Journal of Marketing Management, 25*(7), 825–829. https://doi.org/10.1362/026725709X471659

Drucker, P. F., & Maciariello, J. (2008). *Management*. Harper Business; Revised edition.

Ebstein, R. P., Novick, O., Umansky, R., Priel, B., Osher, Y., Blaine, D., Bennett, E. R., Nemanov, L., Katz, M., & Belmaker, R. H. (1996). Dopamine D4 receptor (D4DR) exon III polymorphism associated with the human personality trait of Novelty Seeking. *Nature Genetics, 12*(1), 78–80. https://doi.org/10.1038/ng0196-78

Erlenmeyer-Kimling, I., & Jarvik, L. F. (1963). Genetics and intelligence: A review. *Science, 142*, 1477–1479. https://doi.org/10.1126/science.142.3603.1477

Fatoki, O. P., & Fatoki, T. H. (2020). Experiential marketing: Effects on brand, customer and market experience, and industrial applications with perspectives from Nigeria. *Marketing – from Information to Decision Journal, 3*(1), 58–66. https://doi.org/10.2478/midj-2020-0005

Fatoki, T. H. (2021). Biomarketing: Understanding brand perception through biological process, and user-friendly materials and platforms. *Scientific Bulletin, 26*(1), 32–38. https://doi.org/10.2478/bsaft-2021-0004

Fowler, J. H., Baker, L. A., & Dawes, C. T. (2008). Genetic variation in political participation. *American Political Science Review, 102*(02), 233–248. https://doi.org/10.1017/S0003055408080087

Frizzo-Barker, J., Chow-White, P. A., Charters, A., et al. (2016). Genomic big data and privacy: Challenges and opportunities for precision medicine. *Computing Supported Cooperative Work, 25*, 115–136. https://doi.org/10.1007/s10606-016-9248-7

Gleick, J. (1987). *Chaos: Making a New Science*. Penguin Books.

Galton, F. (1869). *Hereditary genius*. Galton.org. Retrieved from https://galton.org/books/hereditary-genius/text/v5/galton-1869-hereditary-genius-v5.htm

Hodkinson, P. D., Anderton, R. A., Posselt, B. N., & Fong, K. J. (2017). An overview of space medicine. *British Journal of Anaesthesia, 119*(Suppl. l_1), i143–i153. https://doi.org/10.1093/bja/aex336

Ivanova-Kadiri, I. (2023). Customer genetic data for business: Empowering your genes for sustainable product development. In Z. Nedelko & R. Korez Vide (Eds.), *Strengthening resilience by sustainable economy and business—Towards the SDGs* (pp. 619–628). University of Maribor. https://doi.org/10.18690/um.epf.3.2023

Kang, B. S., Cho, C. H., & Baek, J. D. (2012). The effects of service quality on customer satisfaction in case of dissatisfied customers. *Asian Journal on Quality, 8*(1), 27–39. https://doi.org/10.1108/15982688200700003

Kitchin, R., & McArdle, G. (2016). What makes big data, big data? Exploring the ontological characteristics of 26 datasets. *Big Data & Society, 3*(1), 205395171663113. https://doi.org/10.1177/2053951716631130

Kuechle, G. (2019). The contribution of behavior genetics to entrepreneurship: An evolutionary perspective. *Journal of Evolutionary Economics, 29*, 1263–1284. https://doi.org/10.1007/s00191-019-00634-x

Martin, D., & Schouten, J. (2013). *Sustainable marketing* (1st ed.). Pearson. https://www.perlego.com/book/812073/sustainable-marketing-pdf

McGue, M., & Gottesman, I. I. (2015). Behavior genetics. In R. L. Cautin & S. O. Lilienfeld (Eds.), *The Encyclopedia of Clinical Psychology*. https://doi.org/10.1002/9781118625392.wbecp578

McGue, M., Hirsch, B., & Lykken, D. T. (1993). Age and the self-perception of ability: A twin study analysis. *Psychology and Aging, 8*, 72–80. https://doi.org/10.1037/0882-7974.8.1.72

Moldavsky, M., Lev, D., Lerman-Sagie, T., & D, M. K. (2001). Behavioral phenotypes of genetic syndromes: A reference guide for psychiatrists. *Journal of the American Academy of Child & Adolescent Psychiatry, 40*(7), 749–761. https://doi.org/10.1097/00004583-200107000-00009

Mowen, J., & Minor, M. (2002). *Consumer Behavior: A Framework*. American Marketing Association. https://www.consumerbehavior.net/

Nicolaou, N., Shane, S., Cherkas, L., Hunkin, J., & Spector, T. D. (2008). Is the tendency to engage in entrepreneurship genetic? *Management Science, 54*(1), 167–179. https://doi.org/10.1287/mnsc.1070.0802

Plomin, R., DeFries, J. C., Knopik, V. S., & Neiderhiser, J. M. (2013). *Behavioral Genetics* (6th ed.). Worth Publishers.

Petronis, A. (2010). Epigenetics as a unifying principle in the aetiology of complex traits and diseases. *Nature, 465*(7299), 721–727. https://doi.org/10.1038/nature09230

Robinson, G., Grozinger, C., & Whitfield, C. (2005). Sociogenomics: Social life in molecular terms. *Nature Reviews Genetics, 6*, 257–270. https://doi.org/10.1038/nrg1575

Schumpeter, J. (1950). *Capitalism, socialism and democracy* (4th Revised ed.). Harper Torchbooks.

Stanford Encyclopedia of Philosophy. (2017). Genotype-phenotype distinction. *Stanford Encyclopedia of Philosophy*. https://plato.stanford.edu/entries/genotype-phenotype/

Tesei, D., Jewczynko, A., Lynch, A. M., & Urbaniak, C. (2022). Understanding the complexities and changes of the astronaut microbiome for successful long-duration space missions. *Life, 12*(4), 495. https://doi.org/10.3390/life12040495

Visscher, P. M., Brown, M. A., McCarthy, M. I., & Yang, J. (2012). Five years of GWAS discovery. *American Journal of Human Genetics, 90*(1), 7–24. https://doi.org/10.1016/j.ajhg.2011.11.029

Zhao, H., & Seibert, S. E. (2006). The Big Five personality dimensions and entrepreneurial status: A meta-analytical review. *Journal of Applied Psychology, 91*(2), 259–271. https://doi.org/10.1037/0021-9010.91.2.259