

# Would You Like Some (Artificial) Help with That? Personalizing Health Supplements with AI

Derrick Park

Mercersburg Academy

## ABSTRACT

A growing number of companies in the healthcare industry are offering consumers the option to personalize their products. The growing use of vitamins and dietary supplements prompts the exploration of artificial intelligence (AI)'s role in optimizing supplement recommendations. This paper investigates the potential integration of medical AI into the personalization of vitamin supplements to enhance consumer healthcare. The influence of AI-assisted medical recommendations was assessed by considering the interplay of patient self-identity and health concerns in choosing between human doctors and AI as evidenced by the Extended Self Theory, the IKEA Effect, *uniqueness neglect*, and consumer openness. By surveying the literature, this paper aims to explore the benefits of medical AI in the vitamin supplement market; the issues affecting AI uptake in the vitamin supplement market; and a broad theoretical profile of consumers best prepared to switch from a human doctor to AI customization. While acknowledging the current gaps in AI's capabilities and the challenges of establishing consumer trust in AI-enabled healthcare, this review envisions a future where AI stands as a tool to empower patients and collaborate with human doctors to optimize patient well-being and healthcare. Subsequent investigation might bridge the disparity between the current capabilities of AI in medical support and its potential for widespread adoption.

## **Introduction**

The majority of U.S. consumers currently use vitamins and other dietary supplements (Dickinson et al., 2015). The role of multivitamin supplements in disease prevention and health maintenance is controversial, but observational studies and large-scale, randomized, controlled trials suggest multivitamin supplements may reduce the risk of some forms of cancer and cardiovascular disease (Blumberg et al., 2018). If vitamin supplements do offer health benefits, it is reasonable to expect that high personalization of vitamin supplements would better accommodate the achievement of individual health goals than a depersonalized approach. *Product personalization* is a process that defines, or changes, the appearance or functionality of a product to increase its personal relevance to an individual, and a high degree of design authority is desirable in visual components of products that allow consumers to self-express (Muge et al., 2007). The mode of vitamin supplement recommendation, whether by human doctors or medical AI, relies as much on a patient's self-identification as it does on their health concerns. Product personalization of vitamin supplements may be arrangeable to best fit the combination of the recommendation process and identity concerns.

AI is a branch of computer science that uses algorithms to analyze data and make autonomous decisions. Open-mindedness appears to be a precondition for the adoption of AI innovations (Frank et al., 2021). The choice to incorporate AI into a doctor-recommended regimen is often the product of a larger proclivity toward acceptance of the technology. Recommendations are more likely to be followed if given by a doctor assisted by AI, rather than determined solely by AI (Soellner & Koenigstorfer, 2021). The assistive aspect of AI must, therefore, be in line with the limited trust lent to it by human participants. The potential for AI to assist in the choosing of vitamin supplements is moderated by concepts of the extended self, *uniqueness neglect*, and the IKEA effect, which suggest difficulties in handing over medical tasks to AI that must be overcome before AI assistance becomes beneficial.

## **The Extended Self Theory**

According to Belk's theory of the extended self, self-extension can occur through control and mastery of an object, creation of an object, knowledge of an object, or contamination of an object (proximity and habituation to an object) (1988). Self-extension through control and creation occurs when a consumer puts together a purchase that requires some degree of assembly. Assembling products fulfills the consumer's psychological desire to signal competence, and the association of a self-made product with competence increases the product's valuation (Mochon et al., 2012). It is likely that consumers who participate in the creation of their vitamin regimen will feel a greater attachment to the decision-making process. Customer attitudes toward a brand can be positively influenced by the brand's personality associations (Aaker, 1999). Consumers consider brand name and price more than any other criteria (Agyekam et al., 2015). People diverge from the majority to avoid communicating an undesirable identity, and the social group associated with a product makes a big difference in its desirability (Berger & Heath, 2007). Therefore, consumers make certain decisions on the basis of AI depending on the "branding" of the AI and its correspondence to the consumer's self-perception.

## **The IKEA Effect**

Firms will personalize more products if personalization is cheap, but they will also invest in high-cost personalization if customers are sufficiently heterogeneous (Arora et al., 2008). Customization can be challenging because consumers are not always willing and able to process every option (Arora et al., 2008). Consumer acceptance of personalized offers depends on how easy it is for a consumer to see how recommendations were developed, and recommendations not in line with a consumer's initial preference can decrease choice satisfaction and confidence (Arora et al., 2008). Labor can be sufficient to create a preference for the fruits of labor: this is known as the IKEA effect (Norton et al., 2012). Still, consumers prefer less freedom in instances of private personalization that require a disproportionate investment in time and effort (Mugge, 2007). Engagement in the personalization process can change a consumer's perception of a product's worth and effectiveness. The uptake of AI in personalized medicine must consider the bias that humans have in favor of themselves and other humans (in this instance, human doctors) and the effects of this bias on consumers' enjoyment of the personalization process.

## **Consumer Autonomy and *Uniqueness Neglect***

While AI enhancements can contribute to consumer well-being by making consumer choices more efficient, they can also undermine consumers' sense of autonomy in the context of decision-making (André et al., 2017). André et al. (2017) define autonomy as "one's ability to 'be [one's] own person, and to be directed by considerations, desires, conditions, and characteristics that are not simply externally imposed upon one, but are part of what can somehow be considered one's authentic self'" (p. 29). On the other hand, AI medical technology enables more autonomy for the patient in the context of the patient-doctor relationship (Briganti & Le Moine, 2020). In general, the effect of AI on patient autonomy concerns can be ameliorated even by small openings in which patients can assert their preferences (Carmon et al., 2019). Frank et al. (2021) suggest that a one-unit increase in the measure of perceived trust in AI medical technology results in a sevenfold increase in the likelihood that people choose medical AI over a human doctor. Patients with higher speciesism (human cognitive discrimination or prejudice against other species) are less likely to accept medical AI in an independent role but more likely to accept it in an assistive role (Huo et al., 2023). People who score lower in perceived social belongingness are more likely to adopt an AI approach to medicine, but it is unclear whether they prefer AI because they feel disconnected or whether they feel disconnected because they prefer AI (Frank et al., 2021). Whatever the cause of the distrust, medical AI must become empathetic and emotional to some extent before taking on the work of doctors (Varlamov et al., 2019).

Consumers are reluctant to deal with medical AI due in part to *uniqueness neglect*, the concern that AI providers are worse than human doctors at accounting for a person's uniqueness (i.e., unique symptoms, circumstances, and characteristics) (Longoni et al., 2018). Perceived *uniqueness neglect* from human physicians makes a person more likely to opt for AI medical care (Frank et al., 2021). Consumers rely on humans more than on algorithms (Efendic et al., 2023; Larkin et al., 2020), even when humans are outperformed by algorithms (Yokoi et al., 2021; Zhou et al., 2022), but preference for algorithms is higher when performance data is supplied (Castelo et al., 2018; Pezzo & Beckstead, 2020). Castelo et al. (2018) found that study participants preferred an algorithm to a human only when the task was framed as an objective one and the participants were aware of the algorithm's performance. Still, even the involvement of explainable AI can backfire if patients have trouble understanding it (Rosenbaum et al., 2023). Mass adoption of medical AI will require walking a delicate tightrope between consumers' fear of AI and their desire for data-driven care.

## Consumer Openness

The vitamin market is large, but certain segments of the consumer population are more open to supplement use. In Kirk et al. (1998), dietary supplement use among women was associated with being vegetarian, vegan, or fish-eating, consuming more fruit and vegetables, being more physically active, and having a lower alcohol intake; dietary supplement use was less likely in those with a high BMI and regular smokers. Gender, age, education, and vegetable intake are all predictive of supplement use (de Jong et al., 2003). Positive lifestyle factors are also associated with dietary supplement use (Greger, 2001). To the extent that a specific mode of AI assistance in decision-making can take on the qualities of a brand, the psychological and identity profile of the consumer will affect her attitude toward that brand. Therefore, a successful mode of AI assistance for the process of vitamin supplement personalization will likely be one that appeals to a health-based lifestyle demographic. Though women are a large segment of the supplement market, they are less likely than men to adopt AI when the outcome is considered consequential (Davenport et al., 2020). Therefore, vitamin supplement use is popular, but it also occurs in a population predisposed to avoiding AI.

## Methods & Conclusion

AI presents an opportunity for patients to become more involved in their health regimen by allowing for faster, cheaper, and more effective personalization of vitamin supplements, but only if pains are taken to avoid the negative perceptions of AI that prevent a smooth transition from human doctors in data-driven areas of care. This study utilizes scholarly articles to analyze the potential for the use of medical AI in the personalization of health supplements. The paper aims to determine 1) the benefits of medical AI in the vitamin supplement market, 2) the issues affecting AI uptake in the vitamin supplement market, and 3) a broad theoretical profile of consumers best prepared to switch from a human doctor to AI customization. This study does not employ any primary data to determine whether multivitamins are preferable in a healthy diet. This study also does not discuss specific machine-learning approaches to medical AI. There are still many open questions on the efficacy of vitamin supplements. As medical AI is driven by data, its recommendations will improve with increased medical knowledge. Future research may also index the actual and potential uses of AI assistance in medicine.

According to Adams et al. (2020), personalized nutrition is nutritional behavior revolving around "individual-specific information, founded in evidence-based science, to promote dietary behavior change that may result in measurable health benefits" (p. 1). AI is well-adapted to solving complex problems in areas with large amounts of data and little theory, and AI-powered medical technologies enable a 4P model of medicine (predictive, preventive, personalized, and participatory) (Briganti & Le Moine, 2020). AI can help healthcare systems save money and increase the accuracy of treatment strategies (Azevedo et al., 2022). Human doctors often misdiagnose patients; AI, on the other

hand, can analyze patient records, patient family history, and the patient's genome, as well as warn about disease risks and design unique treatment pathways (Azevedo et al., 2022). The uptake of medical AI is dependent on the consumer perspective as well as the medical, and certain demographics are more open to using medical AI than others. The democratization of the internet has led patients to try and regain control over their healthcare choices, and AI-enabled healthcare applications allow patients to become active participants in their health, reduce costs, and improve the health of populations (Azevedo et al., 2022). If distrust in the process decreases, AI medical tech has a promising future.

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