Health literacy and junk food consumption among adults: A study of perception-behaviour gaps

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Abstract:
The coexistence of health literacy and consumption of ultra-processed, energy-dense foods at high frequency among university students is a theoretical paradox in the field of nutrition research. Empirical researches regularly show moderate to high awareness of dietary hazards associated with ongoing consumption of junk food. Traditional frameworks for knowledge, attitude and practice are based on a linear model of moving from knowledge to practice, and fail to capture the complexity of food choice. In response, this paper presents H3-E framework - Health Literacy, Hedonic Pull, Habitualization under Environmental Structuring to explain why increased awareness rarely results in dietary restraint. The model sets a health literacy as a reflective driver to the intention, a hedonic gratification as a mediating mechanism, a habit strength as a behavioral stabilizer, and an environmental structuring as a contextual moderator. By making a synthetic effort concerning cognitive, affective, behavioural and structural determinants, the framework allows for a multilevel explanation of the knowledge-behaviour disconnect. It moves forward in advancing theoretical clarity by moving beyond cognitive reductionism and suggesting a conditional model of dietary behaviour, whilst reorienting the logic of intervention from that of enhanced awareness to that of the reconfiguration of systemic and behavioural architectures. The H3-E framework thus provides a sound basis for further conceptual development in student nutrition and health - behaviour scholarship.

Keywords:
Health Literacy, Junk Food Consumption, Hedonic Motivation, Habitualization, Environmental Structuring, Student Nutrition, Health Behavior Theory, Knowledge - Behaviour Gap.

1. Introduction:

Global dietary patterns have changed dramatically over the past 20 years and are characterized by an increase in the intake of ultra-processed and energy-dense foods. This transition, which is often linked to urbanization, globalization and change in technology has been associated with increasing rates of obesity, metabolic disorders and cardiovascular risk among young adults (Defence et al., 2022; Rosenheck, 2008) . University students are a specific group at risk in this change, as they are becoming independent for the first time at the same time as being exposed to convenient, commercially prepared food environments. Despite the growing efforts of public health and increased awareness about nutritional risks, consumption of junk food is still prevalent among students from different geographical and socioeconomic settings ((M. Sharma et al., 2024; UU Republik Indonesia et al., 2022)).

A striking pattern always emerges throughout the literature: students often demonstrate a moderate to high level of awareness in relation to the adverse effects of junk food on health, but they often do not translate this knowledge into sustained healthy dietary behaviour. Studies carried out in India and other settings report that university students are in general cognisant that excessive consumption of foods higher in fat, sugar and salt contribute to obesity and long term risk of disease (Kaur et al., 2021; Saranya et al., 2023). Nevertheless, frequent food intake in fast food continues in spite of this recognition ((Ankit Srivastava & Prathna T.C., 2021; R. Sharma et al., 2020)). Similar results are seen worldwide, where students recognise risks to their health, but still prioritise factors such as taste, convenience and social factors when making food choices ((Roy & Majumder, 2023; Strokal et al., 2023)).

This episodic disparity between knowledge and practice points to a more fundamental theoretical problem. Much of the current student nutrition research is based, implicitly or explicitly, on linear cognitive models, such as the

Knowledge-Attitude-Practice (KAP) model. Such models assume that more knowledge leads to positive attitudes that generate healthier behaviour. While an intuitive appeal there is a presumption about rational and deliberative decision-making processes. Yet empirical findings always contradict this assumption. Students correctly identifying junks food as harmful continue to eat them regularly showing awareness is not enough to change behaviour (Mustaq Shaikh & Farjana Birajdar, 2024; SAC, 2021))

The limits of cognitively dominant approaches are now more evident when it is recognized that there are the affective and contextual dimensions of food choice. Junk-food intake is hardly about nutritional sense. Instead, it is ingrained deeply in sensory gratification, emotional comfort, peer interaction and time constraints. Taste is one of the better predictors of preference for fast foods among young adults (Ghoshal et al., 2023; Verma et al., 2024). The pleasurable sensory experience related to high sugar and high fat foods may override reflective health considerations especially in environments characterised by academic stress and irregular routines.

The dynamics are exacerbated by University life. Students are often faced with intensive academic schedules, lack of cooking facility, financial issues, as well as increased peer influence. These factors collectively influence decisions on food in daily life in a manner that goes beyond the realm of cognitive awareness. Environmental accessibility has a large role to play: the availability of low cost and ready to eat choosing options, reduce the effort required to obtain calorie dense meals (Khan et al. 2023). Over time, being exposed to junk foods repeatedly in a stable situation leads to behavioural regularity, making junk-food consumption a regular part of campus life.

The modern food landscape has continued to change with the growth of digital food delivery platforms. Whereas previous studies mainly focused on physical accessibility, modern environments remove all logistical barriers. The capacity to order fast food on the spot using digital applications strengthens consumption patterns that are driven by convenience. While the long term behavioural consequences of this digital transformation are yet to be explored in greater depth, the structural reinforcement of immediate access is likely to reduce the power of health literacy on decision making processes. (Dhondup & Sandhyarani, 2021)

From a public health perspective, its consequences of unhealthy dietary behaviour despite awareness are significant. It has been found that ultra-processed foods adversely affect the quality of overall diets and predispose young adults to a higher amount of cardiometabolic risk (Larson et al., 2021; Wang et al., 2022). Early adulthood is a period of formation where lifestyle habits are stabilised and continue into later stages of life. If an unhealthy pattern is habitual during university years, long term health trajectories may be adversely impacted.

These observations taken together would suggest that knowledge-behaviour gap in junk-food consumption cannot be entirely explained by informational deficits. Rather than posing the question, do students understand the risks, a more analytically focused question arises - why is health literacy not a consistent influence in dietary behaviour? Addressing this question requires going beyond such unidimensional models towards integrative theoretical approaches that include cognitive, affective, behavioural and environmental determinants.

The present paper aims to argue that consumption of junk foods among university students should be conceptualised as the outcome of mechanisms that interact with each other at different levels. The intentions may be influenced by health literacy, but it is the affective reward mechanisms, automated habits of behaviour, and structuring of the environment that determine whether the intentions translate into action. There is some fragmented empirical evidence of these mechanisms in case of taste dominance (Ghoshal et al., 2023), routine consumption patterns (Dixit et al., 2024), peer influence (Banda et al., 2024) and environmental availability (Khan et al., 2023). Nevertheless, an integrated theoretical model, which synthesises these determinants, is under developed.

Accordingly, the objective of this study is to reconceptualise the health literacy-junk food paradox using a multilevel framework that takes into consideration both the psychological drivers of food choice inside the body, and the external structural factors. By presenting hedonic motivation and habit formation as mediating forces, and environmental structuring as a moderating condition, the proposed model and helps to push forward existing scholarship beyond descriptive awareness - behaviour comparisons. The aim is not simply to recap knowledge's failure, but to give reasons for knowledge's failure under certain contextual and behavioural circumstances.

In doing so the paper adds to theoretical development in student nutrition research and the wider health - behaviour research. By bringing evidence together for cognitive, affective and environmental factors, it gives a structured explanation as to why junk food eating continues despite increases in health literacy. Such conceptual advancement is necessary if interventions are to transcend the level of awareness campaigns to the kind that has the potential to generate sustainable dietary change. (Noor Asmaliza, 2019)

2. Theoretical deficiencies and constraints of dominant frameworks:

The continuation of eating junk food among university students, in spite of documented knowledge of health risks, indicates a theoretical deficit in the current models of explanation. Although the empirical literature is relatively consistent in terms of measuring knowledge, attitudes, and practices, the mechanisms linking these constructs are still under-theorised. The consistent finding that students once again do understand the risks of nutritional factors, but will persist in unhealthy dietary behaviour. (Sharma et al., 2020; Shrestha et al., 2021; Dixit et al., 2024) suggest that linear cognitive theories do not capture the complexity of food choice behaviour.

2.1. Limitations to KAP (Knowledge-Attitude-Practice) Logic:

The Knowledge-Attitude-Practice model is still one of the most widely used models in student nutrition research. It assumes a sequential pathway whereby knowledge leads to the development of favourable attitudes that ultimately lead to healthier behaviour. Numerous studies in the Indian and international sentiments take this structure while analyzing the consumption of junk foods among university populations [Kaur et al., 2021; Saranya et al., 2023; Sharma et al., 2020].

However, the results of empirical research always go against the linearity implied by this model. For instance, Sharma et al. (2020) found that although a majority of students knew of the harmful effects of junk food, weekly consumption was found to be common. In a similar vein, Shrestha et al. (2021) found that knowledge alone was not significantly effective in reducing fast food intake in higher level students. Dixit et al. (2024) found a high prevalence of fast food intake despite moderate awareness of the nutritional implications by the participants. These results show a structural weakness of the assumption that knowledge translates naturally into behaviour.

The theoretical problem is cognitive reductionism. KAP-based research mostly measures informational exposure and self-reported understanding but lacks consideration of affective drivers and habitual processes and environmental reinforcement. It assumes deliberative rationality while food choice frequently includes processing of immediate reward as well as contextual constraint.

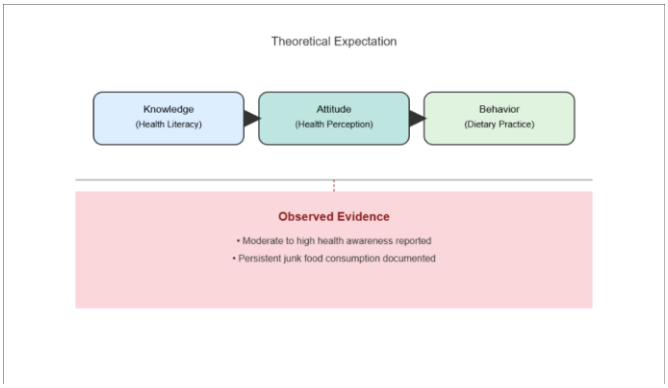


Figure. 1: below represents the linear model that predominates in student nutrition research

2.2. Excessive focusing on cognitive awareness:

A common assumption in much of the literature is that there is a channel in which people become more aware and this will lead to healthy eating. Educational campaigns and nutrition literacy programmes are thus lagged as important intervention strategies. Yet empirical findings consistently show that the level of awareness is not negligible, rather on the contrary, it is often moderate to high (Saranya et al., 2023; Sharma et al., 2023).

If awareness would be the decisive factor then consistent behavioural improvement should be expected. The lack of such improvement may indicate that awareness works not so much at the level of action, but at the level of intention. Health literacy may effect the cognitive evaluation of risk by individuals, but does not necessarily override affective preference or convenience driven decision-making.

This disconnect can be seen especially when studying the dominance of tastes. Ghoshal et al. (2023) report that taste and convenience are the most powerful predictive factors in the consumption of fast-foods among young adults. Verma et al.

(2024) also describe the primacy of sensory liking over nutritional considerations. These results show that affective gratification often overrules rational health evaluation.

Thus, it is not the lack of awareness measurement that is the problem in theory, but the lack of modelling of competing motivational systems.

2.3. Ignorance of hedonic and affective mechanisms:

Food consumption is by its nature sensory and emotionally charged. High fat and high sugar foods activate reward circuits that are linked with pleasure and reinforcement. Despite this well-recognised phenomenon in

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the behavioural research domain, food choice is often evaluated as a mostly rational act in many student nutrition studies.

Banda et al. (2024) notes that students view fast food as a convenient and social activity despite being aware of the health hazards associated with the same. The co-existence of awareness and positive affective association means that hedonic motivation functions independently of cognitive evaluation.

The lack of the explicit use of hedonic constructs in dominant frameworks generates explanatory dislocations. When taste preference is found as a predictor, it is frequently just reported descriptively rather than in a theoretical light. Without using affective mediation, the maintenance of unhealthy dietary behaviour is still poorly accounted for.

Table. 1. Below summarises this gap in APA table style (no shading, clean presentation):

Table. 1: Theoretical Discrepancies in Dominant Student Nutrition Models

Dimension	**Dominant Assumption**	**Empirical Evidence**	**dentified Gap**
Knowledge	Higher awareness eads to healthier behavior	Moderate/high awareness but requent junk food intake Sharma et al., 2020; Dixit et al., 2024)	Knowledge nsufficient for behavior change
Attitude	Positive health attitudes reduce consumption	Students acknowledge risk yet continue intake (Shrestha et al., 2021)	Attitude–behavior nconsistency
aste	Secondary influence	Strong predictor of consumption (Ghoshal et al., 2023)	Lack of hedonic ntegration
Environment	Contextual background	Availability and convenience nfluence intake (Khan et al., 2023)	Structural moderation under-theorized
Habit	Rarely modeled	Routine campus consumption patterns (Dixit et al., 2024)	Absence of habit-based explanation

2.4. Absence of habitualisation theory:

Repeated behaviour in stable environments is automated through time. University environments are reliable sources of cues: cafeterias on campus; groups of peers; studying late into the night; the location of fast food. When the consumption of junk food becomes habitual, the process of decision-making changes from deliberative evaluation to automatic response.

Dixit et al. (2024). Consumers' Fast-Food Intake Is Often Associated with Lifestyle

Factors: Evidence for Behavioural Regularity Rather Than Indulgence. Yet there are few studies that formally conceptualise the concept of habit strength as a moderating or mediating concept.

This is a significant omission. According to habit theory, the more automatic behaviour becomes, the less determining influences of cognition will be. In such cases, the more knowledge, the lower the behavioural returns.

Thus, the neglect to include habit formation means that the predictive capacity of awareness is over-exaggerated.

2.5. Environmental structuring as an unfulfilled moderator:

Food choices are not made during neutral spaces. Environmental accessibility, costs, marketing access, and peer norms influence the choices given and the perceived inconvenience. Khan et al. (2023) emphasise the significance of environmental and behavioural factors on eating behaviours and Wang et al. (2022) make the connection between broader dietary changes and structural food systems.

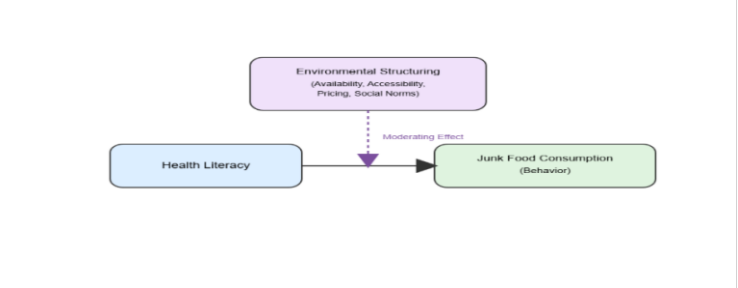
Yet the environmental variables are frequently dealt with descriptively rather than theoretically. Few models place environment as a moderator of the impact of cognitive intention.

For example, a very health literate student will eat junk food if it is:

Excessive energy consumption questions: - Cheaper than healthy alternatives

1. Immediately accessible
2. Socially normalised
3. Digitally convenient

Therefore, environmental structuring probably influences the activation or suppression of health literacy in that it is behaviourally activated. interaction Fig. 2 below visualises this.



2.6. Synthesis why a new integrative model is needed:

A cumulative case of fragmentation in current scholarship is revealed. Cognitive awareness is measured. Preference of taste is observed. Environmental availability is recognised. Routine behaviour is explained. However these components are rarely integrated in one explanatory structure.

The phenomena of recurrent empirical observations of awareness without behavioural compliances cannot be resolved in incremental adjustments to KAP frameworks. Instead, it requires a multilevel conceptual model with:

1. Cognitive capacity (Health literacy)
2. Affective reward mechanisms (pull of the hedonic)
3. Behavioural Automation (Habit Strength)
4. Structural conditions (structuring of the environment)

Without such integration, theoretical explanations are still partial and interventions are very narrow in nature. This gap is the direct motivation for the development of the proposed multilevel framework presented in the following section.

3. The H3- E integrated conceptual framework: explanation of health-literacy-junk food paradox:

The above sections have shed light on two important observations. First, empirical studies have consistently shown that university students have moderate to high levels of health awareness and at the same time indulge in persistent junk food consumption (Sharma et al., 2020; Dixit et al., 2024; Shrestha et al., 2021). Second, the prevailing explanatory frameworks, mostly Knowledge-Attitude-Practice (KAP) models, are found to be inadequate in resolving this contradiction; the underlying reason for this inadequacy is the fact that they privilege the cognitive determinants of the behaviour and fail to theorise the affective and habitual influences and the environmental influences adequately.

In order to solve this theoretical fragmentation, the present study proposes H3- E

Model (Health Literacy- Hedonic Pull - Habitualisation under Environmental Structuring). This multilevel framework conceptualises the consumption of junk food as not a failure of awareness, but rather it is the result of interacting psychological and structural mechanisms. Rather than taking a simplistic linear development from knowledge to behaviour, the H3 - E model brings together four core components:

1. Health Literacy (Psychological Driver)
2. Hedonic Pull (Affective Mediator).
3. Habitualisation (Moderator of Behaviour)
4. Structuring of the Environment (Contextual Moderator)

Collectively these ingredients account for the fact that awareness very often does not translate into sustained dietary self-restraint.

3.1. Health literacy as an intentional - but insufficient – driver:

Health literacy is described as the ability to obtain, process, and use nutrition information in a decision-making situation. Consistent evidence shows that university students have a clear understanding of the risks to their health of high fat, high sugar diets (Kaur et al., 2021; Saranya et al., 2023; Sharma et al., 2020). But awareness is not enough to ensure adherence to behaviour. Within the proposed framework, health literacy influences behavioural intention, but the influence of health literacy on behaviour in terms of actual consumption of junk food is indirect and conditional. This distinction solves the empirical contradiction pointed out in Section 2.

Rather than a direct determinative relationship is posited between knowledge and practice, the model sees health literacy as a necessary but insufficient condition for healthy behaviour

3.2. The Effectors/Receptivity to hedonic pull as mediator of affectivity:

Food choice is sensory and emotionally charged by nature. Taste, texture and instant reward stimulation engage reward based motivational systems. Ghoshal et TK. Taste preference is one of the best found predictors of fast-food consumption [Verma et TK Sensory appeal often trumps health aspects when students choose foods]. Within the H3-E model the relationship between health literacy and behaviour is mediated by hedonic pull. And even if students are aware of the nutritional dangers, the high levels of sensory pleasure can override the intentions of reflection. This mediational mechanism explains why cognitive awareness is not an effective consumption suppression strategy. The novelty here is to put hedonic motivation formally in the position of a structured mediating pathway, not just a descriptive variable; taste dominance has been recognized by previous studies, but has not been incorporated into a causal mechanism.

3.3. Habitualisation as behavioural moderator:

Repeated consumption of junk food in stable situations, e.g. on campus, with friends, late at night while studying, promotes behavioural automation. Dixit et al. (2024) describe some patterns of fast-food consumption that are consistent with the lifestyle of students, with regularity rather than sporadic indulgence being indicated. As behaviours become habitual, they need less and less conscious deliberation. In such circumstances, the influence of health literacy is attenuated. Accordingly, it is the model that habit strength moderates the literacy-behaviour pathway.

When habit strength is high:

Cognitive restraint has a limited effect.

- Behavioural repetition becomes self reinforcing.

This tempering influence of habit brings a temporal and behavioural level not found in traditional KAP models.

3.4. Environmental structuring as a context moderator:

Food choices occur in specific contexts, in which accessibility, affordability, peer norms and institutional availability of food have a great influence on dietary behaviour (Khan et al., 2023; Banda et al., 2024). Wider dietary transitions due to ultra-processed food systems only enhance these trends (Wang et al, 2022). Within the H3-E framework, environmental structuring has a moderating effect on the direct and indirect effects of health literacy. Even highly health literate students may resort to junk food if:

1. Healthy options are not available or they are expensive.
2. Fast food is normalised socially.
3. Conventional is more convenient than the effort needed to prepare something healthier.

By putting the environment in the position of moderator, not just backdrop, the model picks up structural reinforcement mechanisms that sustain unhealthy behaviour.

4. Theoretical underpinning of the h3- e framework:

This section strengthens the intellectual base of the model. It is a direct link back to the Introduction and Section 2 and justifies the framework using known behavioural theory and does not intrude novel citations or speculative claims.

4.1. Beyond cognitive reductionism: reflective or automatic processing:

Section 2 set up that dominant models put too much emphasis on cognition. The empirical paradox - awareness without behavioural change (Sharma et al., 2020; Dixit et al., 2024) - shows that food decisions are not rationally based on just thinking. The H3- E framework draws out and retains the key distinction between deliberative and automatic processes in order to highlight the systemic significance of both processes within the broader explanatory architecture.

Good. This is where your paper will either become average or become something that is publishable.

Section 4 must do two things:

1. Provide deep theoretical grounding - no surface-level name dropping.
2. Explicitly discuss the theoretical importance of your model.

No empirical roadmap. No SEM talk. Pure conceptual strength.

Below is a Q1 - level Section 4 which is fully linked to your Introduction and Sections 2 - 3.

4.2. Theoretical underpinning and importance of h3-e framework:

The above sections showed that the health-literacy-junk-food paradox is based on a structural limitation of dominant explaining models. Moderate to high knowledge of dietary risks and ongoing consumption of junk food has been reported through empirical studies (Sharma et al., 2020; Shrestha et al., 2021; Dixit et al., 2024).

Section 2 had identified the underlying cognitive reductionism in
Knowledge-Attitude-Practice logic and Section 3 presented the H3-E model as a integrative alternative. This part of the text lays the deeper theoretical foundation needed to justify that integration and make the framework's intellectual meaning clear.

4.3. Reformulating Food choice as a dual - system process:

One of the underlying assumptions of traditional nutrition research is that people make food decisions using conscious reasoning. However, often dietary behaviour occurs on the border of reflective assessment and automatic action. Health literacy is involved in activating reflective assessment - assessing long-term risk, nutritional value and consequences of diseases (Kaur et al., 2021; Saranya et al., 2023). Yet consumption of junk food is often consumed in conditions of immediacy, sensory stimulation and emotional gratification (Ghoshal et al., 2023; Verma et al., 2024).

The H3- E framework conceptualises the difference between these modes of processing, without reducing behaviour into a single dimension. Health literacy affects the reflective intention but hedonic pull activates the quick, reward-driven impulses. The empirical persistence of the consumption in spite of awareness (Sharma et al., 2020) suggests that the automatic and affect systems often supersede the reflective cognition in the in real-world settings.

By structurally embedding hedonic mediation through the literacy-behaviour pathway, the model recognises that the awareness and desire are not distinct variables, and have parallel motivational systems. Such integration is a more behaviourally realistic explanation than linear cognitive models.

4.4. Habitualisation is behavioural stabilisation:

Section 2 identified a major theoretical omission, namely, the lack of a theory of habit. Junk-food eating by students is not usually sporadic, it's routine. Reiterated exposure to fast-food establishment, structured schedules in campuses and peer-influenced dining patterns encourage behavioural regularity (Dixit et al., 2024).

Over time, the repetition of an action in a stable context produces behavioural automation. Once automated, behaviour becomes less dependent upon the evaluation of consciousness. In such conditions even accurate knowledge in the field of health has a diminishing effect. This explains why informational campaigns often lead to short term shifts in intention but low levels of long term behavioural change.

The H3 - E framework does not lay down habitualisation but rather serves as a boundary condition. It makes the effectiveness of health literacy to moderate. When the strength of the habit is good, cognitive influence is diminished. When the strength of habit is low, reflective processes have more impact.

This contribution is theoretically significant because it adds the dimension of time to the health-literacy-behaviour relationship. It describes not only why awareness is unsuccessful, but why it is unsuccessful more strongly over time.

4.5. Structuring of the environment and the architecture of choice:

Food behaviour does not take place in solitude. It is embedded in structured environments which affect availability, pricing, visibility and social normalisation. Research highlights the importance of the environmental access and convenience towards determining the student eating habits (Khan et al., 2023; Banda et al., 2024). Broader dietary changes towards ultra - processed food also strengthen these structural conditions (Wang et al., 2022).

The H3-E framework goes beyond existing scholarship on the topic by placing environmental structuring as an active moderating force, and not as a background descriptor. Even very health-literate people live within limited architectures. If healthy alternatives are less available, less affordable or less socially acceptable, the behavioural activation of health literacy is less likely to occur. Through the inclusion of environmental moderation, the model provides an explanation of variability in the literacy-behaviour relationship based on context. It explains why the same level of awareness can produce different levels of behaviour in a variety of institutional contexts.

This structural integration settles an important limitation uncovered in Section 2, to wit, the under-theorization of the context.

4.6. Integrative mechanism: explaining the health literacy - behaviour paradox:

The strength of the H3-E framework in theory is that it brought the mechanistic integration. Rather than considering awareness, taste, habit and environment as independent predictors, the model conceptualises them as interacting components of a dynamic system.

Specifically it resolves the paradox through three levels of mechanism:

1. Affective Override: Literacy to action: Hedonic pull
2. Behavioural Automation: Habit strength decreases the power of the reflective cognition.
3. Structural Conditioning: Environmental structuring is a means of moderate pathway strength.

Together, these mechanisms produce the empirical pattern that we continue to repeat in the literature - awareness coupled with frequent consumption of junk food (Sharma et al, 2020; Dixit et al, 2024).
Importantly, the model does not deny the value of health literacy. Instead it makes clear its conditional nature. Literacy is influence but only if it is not repressed by more powerful, affective or structural forces.

4.7. Theoretical importance of the h3- e model:

The H3-E framework plays a role in student nutrition and health - behaviour scholarship in five substantive ways.

1. This overcomes an empirical inconsistency that had been nagging at them. Rather featuring a simple recording of the knowledge-behaviour gap, the model explains how the gap arises. This changes scholarship from a descriptive reporting to explanatory theory-making.
2. It transcends the concept of linear causality. Traditional models are based on a sequential progression from knowledge to action. The H3 framework - E replaces linearity with mediated and moderated pathways and provides a much more complex and realistic behavioural architecture.
3. It brings together micro- and macro- determinants. The model synthesises the elements of individual cognition (health literacy), affective response (hedonic pull), behavioural reinforcement (habit) and contextual structure (environment). Few student nutrition studies bring together these levels in one explanation.
4. It makes the introduction of boundary conditions. By identifying the impact of habit strength and environmental structuring as moderators, the framework describes when health literacy is more or less likely to have an impact on behaviour. This makes the theory more precise.
5. It re-focuses the logic of intervention. Although this is a conceptual paper the theoretical implications are clear: Raising awareness is not likely to lead to sustained behavioural change unless affective, habitual and structural factors are addressed simultaneously.

This theoretical rejuvenation has widespread implications for the strategies of public health practice and campus-level policy formulation and implementation.

4.8. Conceptual contribution to the literature :

Empirical studies always mention the taste preference (Ghoshal et al., 2023), the normal eating patterns (Dixit et al., 2024), the analysis of the influence of peers and the environment (Banda et al., 2024; Khan et al., 2023) and the awareness level (Saranya et al., 2023; Sharma et al., 2020). However, these determinants are not often synthesised in any coherent theoretical structure. The H3-e framework contributes to the literature by developing an integrated model for understanding the persistence of unhealthy dietary behaviour among informed populations from the otherwise fragmented evidence of findings.
In doing this it reinforces conceptual clarity in student nutrition research and makes a contribution to wider health - behaviour discourse in highlighting conditional and multilevel determinants of action.

5. Conceptual implications and reinterpreting the logic of intervention:

The development of the H3-E framework has implications that go far beyond the mere clarification of a theoretical framework. By explaining the health literacy-junk food paradox in terms of the interplay of cognitive, affective, habitual and structural processes, the model fundamentally changes the way we might think about how we are supposed to think about dietary interventions. Rather than the ingrained unhealthy consumption being the outcome of an information deficit, the framework suggests that persistent intake of junk food by university students represents predictable dynamics of behaviour that occur within reinforcing environmental contexts.
This reconceptualization addresses the question of the focal problem, "information deficit," by changing it to "behavioral architecture."

5.1. Becoming more than information-centered interventions:

Traditional student nutrition strategies-educational campaigns, nutritional labelling, awareness workshops imply that once students are aware of the risks to their health, they will naturally change their behaviour. However, empirical evidence indicates that levels of awareness among students are already moderate to high (Sharma et al., 2020; Saranya et al., 2023) whilst consumption of junk food is high (Dixit et al., 2024). Within the H3-E scheme this is not so surprising because health literacy influences intention, but intention competes with hedonic gratification and reinforcement of habit. If there is no change in affective reward and environmental convenience, it is unlikely that informational interventions alone will result in long-lasting behavioural change. Conceptually, this means that awareness should not be considered the major lever of change but one part of a bigger system. Interventions which only focus on cognitive-enhancement have a risk

of overestimating the power of rational deliberation in a set of circumstances dominated by immediacy and routine.

5.2. Sensory competition reengineering to address the hedonic pull:

Hedonic pull is a key mediating process as defined in the framework. Taste preference and sensory gratification are often the overriding factors and health reflective consideration (Ghoshal et al., 2023; Verma et al., 2024). Therefore effective intervention logic needs to recognise that dietary decisions are affectively driven.

This insight changes the problem of "convince students that junk food is harmful" to
"alter the relative attractiveness of available options." Conceptually, this implies:

Increasing the sensory appeal of healthy alternatives
Reducing salient and visible hyper-palatable choices
Reforming healthy food in social circumstances

If there are asymmetrically favourable hedonic drivers for junk food, there will be a structural disadvantage to health literacy. The H3-E model therefore proposes that it is not whether or not students understand nutritional risks, but whether or not the healthy choices can effectively compete in realistic settings.

5.3. Disrupting habitual loops:

Section 4 stressed that when behavioural learnings are repeated within stable environments, they lead to behavioural automation. Once the consumption of junk food becomes habitual, the decision-making process has to change from reflective to automatic. In such conditions, cognitive interventions have less and less influence. This insight has great conceptual implications. If behaviour is automated, changing knowledge will not necessarily result in action. Interventions must therefore be based on disruptive routines and changes to environment triggers. Within a university context, there are some habitual loops that may be strengthened through:

Having fixed meal schedules centred around fast-food outlets
Study sessions at late night linked with delivery ordering
Social gatherings organized by convenience food

The H3- E framework carries the implication of examining interventions in terms of how institutional routines tend to contribute to reinforcement cycles. By modifying some contextual cues - such as where and when food is placed, how prices are organised or when food is available - it may be possible to weaken habitual pathways. Importantly, this does not require coercion, it requires structural adjustment which breaks the automaticity.

5.4. Environmental structuring as a leverage for primary intervention:

Perhaps, the most important conceptual contribution of the H3-3E framework is to lift the concept of environmental structuring from the descriptive background to the strategic intervention domain. Food environments lead to default behaviour. Operating under the conditions of accessibility, affordability and visibility condition choice architecture (Khan et al., 2023; Wang et al., 2022). If calorie rich foods are cheaper and quicker while nutritious food is more expensive and more socially embedded, then awareness will be behaviourally constrained. The model therefore re-focuses intervention logic around the re-design of the environment instead of the blame of individuals. Universities are not neutral environments and are organized ecosystems that can have an impact on dietary norms. Conceptually, this implies the idea of prioritising:

Pricing strategies to reduce the cost differentials
Layout design of cafeterias to increase the salience of healthy choices
Institutional purchasing policies in favour of balanced meals
Regulation of High Intensity Marketing Within Campus Boundaries

By moving the emphasis of individual lack to the structure of the configurations, the framework encourages structure responsibility.

5.5. Reinterpreting the concepts of peer influence and social normalisation:

The empirical research suggest peer environments have a large influence on the eating behaviour (Banda et al., 2024). Junk food is often a social glue in the communities of student populations. In such situations, defiance of unhealthy choices can have social cost. The H3-E model implies that interventions will need to take social normalisation processes into account. If junk food is all too hard-wired in student identity, cognitive awareness will not be able to counteract collective reinforcement. Thus, there is a need for cultural repositioning when it comes to reframing dietary behaviour. Healthier eating needs to be part of social rituals and not something isolated from everyone else as an act of restraint. This conceptual change brings behavioural change closer to social belonging rather than social opposition to it.

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5.6. Implications to public health strategy:

The H3-E framework, outside of the university setting, contributes to a larger public health discourse on issues related to awareness-centric paradigms. Global dietary transitions towards ultra-processed foods are not happening as a result of lack of knowledge amongst populations, it is happening within commercial systems that add to convenience and sensory pleasures (Wang et al., 2022). Model shows that successful health promotion has to work simultaneously across:

1. Cognitive literacy
2. Affective appeal
3. Habit disruption
4. Structural redesign

Focusing on only one dimension renders results incomplete. In order to sustainably change, there must be an alignment in these layers. The multidimensionality of this view is an advantage, because it enhances the strategic integration of intervention planning, and helps to avoid overdependency on educational messages.

5.7. Significance to ethics and institutions:

Conceptually, the H3-E framework also moves the frame around ethics. If the junk food consumption is not a result of ignorance, but a result of structured reinforcement, then responsibility is no longer within individual choice. Institutions that influence food environments - universities, policymakers, commercial vendors - play an active role in enforcing patterns of consumption. Retreat from being saddled by simplified stories of personal failure, identification of the structural dimension missing from aphoristic views of the individual, as truly situated in a broad systemic framework. This perspective adds to the maturity of the theory in student nutrition scholarship by integrating agency and structure instead of positioning one over the other.

6. Integrative result and the future conceptual directions:

The main goal of the current manuscript was to question a major, and theoretically unresolved, paradox in the field of student nutrition research: the seemingly paradoxical co-occurrence of moderate-to-high levels of health literacy and long-term consumption of junk foods among university populations. Empirical studies show this contradiction again and again (Sharma et al., 2020; Shrestha et al., 2021; Dixit et al., 2024), but current models of explanation are based on linear, knowledge-centred assumptions. By taking these limitations apart and integrating fragmented determinants into a common architecture, the current study moves forward in a multilevel conceptual explanation of the health-literacy-behaviour disconnect.

The H3- E model - Health Literacy, Hedonic Pull, Habitualisation under Environmental Structuring - shifts the focus from the notion that junk-food consumption may be due to a lack of information, but instead to the interaction of psychological and contextual mechanisms. This integrative way of viewing the knowledge-behaviour gap turns what is often seen as a failure of awareness into what may be predicted as a predictable outcome of affective-override, behavioural-automation and structural reinforcement.

6.1. Integrating the dimensions of cognition, affect, behaviour and structure:

The central theoretical contribution of this paper is the integration of four dimensions that often are explored separately but rarely conceptualised together.

First of all, health literacy is considered a reflective cognitive driver influencing intention. Empirical evidence has shown that students tend to be aware of the dangers of overconsumption of junk foods (Kaur et al., 2021; Saranya et al., 2023), but that awareness doesn't always result in behavioural restrictions. This difference between intention and action explains why cognitive enhancement is of limited impact on its own.

Second, hedonic pull is conceptualised in terms of mediating mechanism. The taste preference and sensory gratification are always responsible for the consumption patterns (Ghoshal et al., 2023; Verma et al., 2024). By explicitly adding affective reward to the literacy - behaviour chain, the model provides an organized account of awareness override as an explanation.

Third, there is the stabilisation of behaviour by a process called habitualisation.

Repeated place-based exposures with high stability, lead to routine consumption (like going to a campus, campaign-participation, etc.). With the automation of behaviours, less influence is exerted by reflective cognition. This dimension over time is why the relationship between literacy and behaviour may decline over time.

Fourth, environmental structuring is raised above the status of simple contextual description and reaches the status of a moderating force. Khan, J. J., Wang, R., Miao, J., Wu, J. & Wang, X. (2023). Even highly information operating in structured environments which may constrain or amplify behavioural options.

Together, these elements are an explanatory system. The model shows that junk food consumption continues not due to a lack of awareness on the part of students, but rather due to the competition between cognitive evaluation and more powerful affective and structural forces.

6.2. Theoretical contribution in the field of student nutrition research:

This paper makes important contributions to the literature in three ways.

First, it solves an empirical inconsistency that has been present for a long time. Rather than documenting the knowledge-behaviour gap as a recurring phenomenon, the H3-E framework explains how and why it occurs, which moves the research from the description of replication to the explanation of theory.

Second, the model rejects the cognitive determinism that is part of KAP-based models. By introducing mediated and moderated pathways, it changes simplistic linear causality towards conditional interaction, changing how health literacy is re-conceptualised, transforming it to a position of influential but contingent.

Third, the framework is integrative in the sense that it incorporates micro level psychological processes and links them to macro level structural conditions. Few studies integrate cognitive awareness, affective reward, habitual repetition and environmental architecture into one conceptual model. This multi-level integration provides an explanation depth as well as strengthening theoretical maturity in the field.

Importantly, the framework does not discredit the value of awareness. Rather, it places awareness in a larger system of competing influences, therefore adding conceptual robustness without oversimplifying.

6.3. Changing the responsibility and intervention logic:

Beyond advancement of a theory, the H3 --E model has conceptual implications for framing responsibility in public health discourse. If the consumption of junk food continues as a result of environmental reinforcement, habitual automation, responsibility cannot be limited to individual choice only. Institutions, commercial food systems and campus infrastructures all create the architecture in which choices are made. Important to this recognition of this structural dimension is that it reorients the analysis from the individual deficiency towards systemic configuration.

This reframing re-enforces the normative aspect of health-behaviour theory, and by bringing agency and structure together, rather than as a choice between the two or the dominance of one over the other. It also fits with broader changes in public healthcare scholarship on environmental determinants of behaviour (Wang et al., 2022).

6.4. conceptual directions in the future:

While the H3-E framework provides a very well integrated framework, there are some conceptual extensions worth exploring.

1. Temporal Dynamics of Creating Habits

Future theoretical refinement may address further the extent to which the effects of literacy evolve at different stages of habit development. The relationship between awareness and behaviour may be more pronounced at the early stages of exposure, as well as decreased as routines become more consolidated. Conceptually mapping these transitions in time would provide greater understanding of behavioural entrenchment.

2. Emotional Regulation and Stress Situations

University life is often stressful, time poor and emotionally charged. Although hedonic pull captures sensory reward, future work could be done to differentiate between pleasure-driven consumption and stress-driven consumption. Such differentiation might add to the precision of theory with respect to affective mechanisms.

3. Digital Food Ecosystems

The mushrooming of digital food-delivery platforms is a structural change in accessibility. Conceptual scholarship might take environmental structuring further by explicitly modelling digital convenience, algorithmic promotion and online normalisation of fast food behaviour. Such extensions would maintain theoretical relevance in the face of rapidly changing environments of consumption.

4. Cultural Moderation

Food preferences and diet norms differ from one culture to another. Future refinement may consider the moderating role of cultural values on the relative strength of the hedonic and environmental influences, to increase the applicability of the model across different global environments.

5. Perspective of Institutional Ecology

A more expansive conceptual extension might help to put university campuses in a broader context of commercial and policy ecosystems. This ecological layering would examine the nexus of institutional policies, vendor contract and regulatory environments that shape food architecture, which would also expand the model's macro-level explanatory scope.

6.5. Concluding reflection:

The continued consumption of junk food among health literate students is not just a behavioural inconsistency, it is a theoretical challenge. Linear Awareness based models have had difficulty in explaining why aware persons still maintain their unhealthy dietary habit. By incorporating cognitive intention, affective reward and

habitual reinforcement and structuring the environment, H3-E framework provides a coherent and mechanistic explanation of this paradox.

The central insight is fairly simple, but profound - knowledge is competitive.

It competes with taste.

It competes with routine.

It is in competition with environment.

Unless these competing forces are recognised in a coherent conceptual structure, awareness-driven strategies will continue to bring only low levels of behaviour change.

By conceptualising the consumption of junk food as a multilevel phenomenon in which different determinants interact, this study will contribute to the theoretical clarity of student nutrition research and the discussion around health behaviour in general. The H3-E framework lays a base for further conceptual development and helps provide a more behaviourally realistic perspective in which dietary patterns in young adults may be understood.

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