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Effects of social influence and body type on the food choices of others and its associated environmental impacts in Vietnam

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ABSTRACT

This study investigates how peer body attributes (thin vs. obese) and normative portion anchors influence food selection, actual consumption, and downstream organic waste among consumers in Vietnam. Integrating behavioral decision theory with Life-Cycle Assessment (LCA) principles, three controlled lab experiments were conducted with university undergraduates (N = 692 total across studies) to evaluate portion adjustments under varying conditions of food healthiness, cognitive load, and appearance self-esteem. Results indicate that consumers utilize observed peer portion choices as primary quantity anchors, but systematically adjust decisions based on peer physical attributes: participants selected significantly larger portions near thin peers selecting unhealthy options, yet adjusted portions downward near obese peers. This downward adjustment was attenuated under high cognitive load and moderated by appearance self-esteem. Behaviorally, social modeling caused a severe decoupling between serving size and actual intake, leaving up to 61% of selected food unconsumed. By translating discarded food volume into lifecycle carbon footprints (E_f = 1.60 - 5.40 g CO_{2e} per unit/gram), we demonstrate that large peer anchors act as environmental multipliers, increasing waste-driven greenhouse gas emissions up to 27.5-fold (93.69 g vs. 3.40 g CO_{2e} per serving). These findings highlight how social portion anchoring directly drives localized organic waste and supply chain carbon burdens, underscoring the need for default portion architecture and targeted menu sizing in the food and beverage industry.

Keywords: Portion anchoring; Body type; Food waste; LCA; Greenhouse gas emissions.

1. INTRODUCTION

Overweight and obesity have emerged as critical global health challenges, with current estimates from the World Health Organization identifying 1.9 billion overweight adults worldwide, including 650 million who are classified as obese. Although national obesity rates do not strictly correlate with economic development, governments globally prioritize controlling this trend due to its systemic socio-economic and public health implications. Data indicates that study result currently records the highest global obesity rate at 61%, whereas Vietnam maintains the lowest recorded rate at 2.1% (WHO, 2024). However, reports from Fitch Solutions Macro Research (2025) reveal that Vietnam is experiencing the fastest acceleration of obesity in Southeast Asia, with a 38% increase over a five-year period, outpacing regional peers such as Indonesia (33%). According to the Ministry of Health of Vietnam (2021), urban overweight and obesity rates reached 26.8% in 2020, compared to 18.3% in rural areas and 6.9% in mountainous regions. Furthermore, data from the National Nutrition Census 2019–2020 indicates that the prevalence of overweight and obese children in Vietnam grew 2.2 fold, rising from 8.5% in 2010 to 19% in 2020, with inner-city rates exceeding 50% in Ho Chi Minh City and 41% in Hanoi. While foundational literature attributes weight gain primarily to physical inactivity and sedentary lifestyles (Blair & Brodney, 1999), genetic predispositions (Comuzzi & Allison, 1998), or overall increases in portion sizes and energy intake (Chandon & Wansink, 2007; Hill & Peters, 1998; Young & Nestle, 2002), limited empirical research examines how individual food choices and consumption volumes are shaped by the immediate physical presence and choices of observed peers in the Vietnamese context.

The 2024 Vietnam food & beverage market overview highlights a highly dynamic, resilient, and expanding sector that rebounded strongly post-pandemic, generating over VND 655 - 688 trillion (approx. 26–27 billion USD) in revenue through double-digit annual growth. Driven by rapid urbanization, an expanding middle class, and a strong culture of out-of-home dining particularly among Gen Z and young professionals physical restaurants, small cafes, and local eateries continue to dominate market share, while digital delivery platforms and modern retail formats rapidly scale up. Despite broader macroeconomic pressures causing consumers to become more budget-conscious per transaction, overall dining-out frequency remains high, fostering a polarized market landscape characterized by the growth of affordable, convenient, small-format grab-and-go outlets alongside a competitive surge in premium and experiential dining. Concurrently, shifts toward post-pandemic health and wellness are reshaping product demand, accelerating the rise of functional, organic, plant-based, and low-sugar alternatives across both retail shelves and service menus (Dahlia, 2024). As commercial dining out becomes routine, consumer dietary decisions are increasingly susceptible to external

environmental and cognitive anchors (Epley & Gilovich, 2006; Wansink et al., 1998). Prior social influence literature demonstrates that interpersonal presence and non-interactive social cues significantly alter individual consumption patterns and behavioral conformity (Argo et al., 2005; Argo & Main, 2008; Bearden & Etzel, 1982; Bell & Pliner, 2003; Herman et al., 2003; Leary & Kowalski, 1990; Roth et al., 2001). However, there remains a critical gap in understanding how an observed consumer's physical body attributes (e.g., thin vs. obese) interact with perceived food healthiness (Johnston, 2002; Weiner et al., 1988) and cognitive constraints to establish normative portion anchors (Berger & Rand, 2008; Campbell & Mohr, 2008; Christakis & Fowler, 2007; Shiv & Fedorikhin, 1999). To address these gaps, this research establishes three specific objectives: To examine the mechanisms of normative portion anchoring and adjustment under the influence of peer body types and food healthiness within the Vietnamese consumer market.

1. To provide empirical experimental evidence gathered from undergraduate cohorts at Ton Duc Thang University in Ho Chi Minh City.
2. To formulate practical consumer behavior and managerial strategies for F&B operators to promote sustainable consumption.

Utilizing an experimental approach involving 238 female undergraduate participants for Studies 1 and 2 selected due to higher documented sensitivity to social body-image comparisons and 216 male and female undergraduates for Study 3, this study tests three primary hypotheses:

- **Hypothesis 1:** The anchoring and adjustment model based on a peer's body type is bounded within unhealthy food options.
- **Hypothesis 2:** Consumers will consume more food after observing an obese consumer select a small portion relative to a thin consumer.
- **Hypothesis 3:** Neither peer weight nor appearance self-esteem will exert a significant main effect on participant portion selection.

2. RESEARCH METHOD

2.1. Research design and empirical framework

This study adopts a quantitative experimental research design to evaluate how social influence, confederate body type, food healthiness, and situational cognitive constraints dictate consumer portion selection and actual intake within the Vietnamese consumer market. The overall research process follows a seven-step framework: (1) theoretical identification and hypothesis formulation based on portion anchoring and social comparison literature; (2) definition of operational variables; (3) determination of experimental case scenarios and sample sizes; (4) construct measurement scale development; (5) laboratory-controlled hypothesis testing; (6) statistical data analysis; and (7) result interpretation and managerial application.

2.2. Sampling and data collection procedure

Data collection was conducted on the campus of a University, Ho Chi Minh City, using a convenience sampling approach in experimental settings. All participants were verified undergraduate students at the university, and each individual participated in only one of the three empirical studies to prevent crossover effects. Participants were randomly assigned to specific experimental conditions or control groups. Across the three studies, sample allocations comprised 238 female undergraduate students for Study 1, 238 female undergraduate students for Study 2 selected due to heightened sensitivity to body-image social comparison and 216 male and female undergraduate students for Study 3.

2.3. Experimental procedures of the three studies

2.3.1. Study 1: Body type and food healthiness interaction

Study 1 employed a 2 x 2 factorial design combining confederate body type (Thin vs. Obese) and food type (Healthy: Granola vs. Unhealthy: M&Ms), alongside two no-confederate control conditions. Prior to the task, participants completed a 10-item restrained eating scale (RE) to control for dietary restriction tendencies. Participants were invited to evaluate a 5-minute video review on YouTube while consuming provided snacks. In the experimental conditions, participants were paired with a trained female confederate (either thin or obese) who served as an anchor by selecting 5 tablespoons of snacks (≈ 52 g of Granola or ≈ 85 g of M&Ms) in full view of the participant. Participants were subsequently invited to take as many snacks as desired (limited to a single serving action per food type). Unbeknownst to participants, bowls were weighed pre- and post-session to record exact portion selection (grams) and actual consumption (grams). Post-test manipulation checks verified the naturalness of the scenario and participant body type

perceptions.

2.3.2. Study 2: Portion quantity anchoring

Study 2 utilized a 2 x 2 factorial design incorporating confederate body type (Thin vs. Obese) and confederate quantity taken (Small: 2 items vs. Large: 30 items), plus one no-confederate control group. Before beginning, participants completed a preliminary 3-item dietary control scale. Similar to Study 1, participants engaged in a 5-minute video evaluation task accompanied by seven distinct candy bowls. The confederate selected her designated portion first in the presence of the participant - taking either two small candies in the small portion condition or approximately 30 small candies across all seven bowls in the large-portion condition. Participants then selected their desired quantity. Portion selection and consumption counts were recorded, followed by post-task questionnaires capturing weight perception manipulation checks and the full 10-item restrained eating scale.

2.3.3. Study 3: Cognitive load and self-esteem moderation

Study 3 executed a 2 x 2 between-subjects experimental design combining cconfederate body type (Thin vs. Obese) and cognitive load (Low: memorizing a 2-digit number vs. High: memorizing a 10-digit number), while incorporating appearance self-esteem (ASE) as a continuous moderating variable. Cognitive load was manipulated by instructing participants to remember their assigned number for recall at the end of the session. Participants were presented with a simulated ice cream shop purchasing scenario featuring four flavors across five portion sizes: super small (170 g), small (255 g), medium (340 g), large (425 g), and super large (510 g). Participants read a narrative instructing them to observe an oversized or thin customer directly ahead of them ordering an X-Large ice cream cone, after which they indicated their own size selection. Post-experiment measures assessed number recall accuracy, menu manipulation checks, restrained eating, appearance self-esteem, and demographic attributes.

2.4. Operationalization of variables and measurement scales

Primary constructs were measured using established multi-item scales adapted for comprehension within the Vietnamese context. Chronic dietary restriction was assessed via the 10-item Restrained Eating Scale (RE1 to RE10), capturing dieting frequency, historical weight fluctuations, self-control in social dining environments, food-related cognitive preoccupation, and associated eating guilt. Perceptions of peer physical characteristics were evaluated through the confederate body type perception scale (BTC_1 to BTC_3), which measured subjective peer body proportions, direct physical comparison to the participant, and categorical peer body classifications. Individual body image sentiment was operationalized using a 6-item appearance self-esteem scale (ASE 1 to ASE 6) reflecting current body satisfaction, perceived peer respect regarding physical appearance, weight satisfaction, self-perceived health, and overall physical attractiveness. Finally, the success of the cognitive load manipulation was verified using self-report manipulation check items (CL1 and CL2) assessing subjective task difficulty and memory recall effort required during scenario processing.

2.5. Data analysis techniques

Analytical processing was executed using IBM SPSS software. Scale reliability was confirmed using Cronbach's Alpha coefficient across all multi-item constructs. Analysis of covariance (ANCOVA) was applied in Studies 1 and 2 to evaluate main effects and categorical interaction effects of peer body type, food type, and portion quantity on continuous portion selection and intake, while controlling for restrained eating covariates. Hierarchical Multiple Regression analysis was conducted in Study 3 to test the moderating effects of cognitive load and appearance self-esteem on portion size selection.

2.6. Standard conversion emission factors

- Granola/Grains: 1.60 g CO_{2e} per gram of food product.
- M&Ms/chocolate confectionery: 3.20 g CO_{2e} per gram of product (accounting for dairy and cocoa production impacts).
- Hard/chewy candies (sugar confectionery): 1.80 g CO_{2e} per candy item based on average sugar-refining footprints (assuming an average unit weight of 3 g per piece).

Unconsumed food waste volume (ΔW) was calculated at the participant level as

$$\Delta W = \text{Portion Taken} - \text{Portion Eaten}$$

Greenhouse gas emissions (g CO_{2e}) were estimated using Life-Cycle Assessment (LCA) emission coefficients tailored to snack food categories based on global agricultural lifecycle data (Poore & Nemecek, 2018; Heller & Keoleian, 2015):

$$\text{Total Emissions (g } CO_{2e}) = \Delta W \times E_f$$

where E_f represents the category specific carbon intensity factor (E_f = 1.60 g CO_{2e} g for Granola; E_f = 3.20 g CO_{2e} g for M&Ms; E_f = 5.40 g CO_{2e}/unit for confectioneries) (Poore & Nemecek, 2018).

Across both studies, peer-driven portion choices significantly elevated localized carbon footprints, compounding downstream landfill burden and organic food waste degradation dynamics (FAO, 2013; IPCC, 2019). In Study 1, social modeling around thin peers selecting unhealthy snacks generated the highest waste emissions per serving. In Study 2, exposure to a large portion anchor (30 candies) increased unconsumed waste emissions by up to 26.6 times compared to a small portion anchor.

3. RESUTLS AND DISCUSSION

3.1. Study 1: Healthiness vs. body type anchoring

The empirical results across the three studies demonstrate that social presence and physical attributes significantly regulate consumer food choices and intake through an anchoring and adjustment framework. Study 1 confirmed high scale reliabilities for Restrained Eating ($\alpha = .943$) and Confederate Body Type ($\alpha = .988$), while an ANCOVA validated the weight perception manipulation check ($F = 960.403$, $p < .001$) (Table 1).

Table 1. Official Cronbach's alpha analysis results of Study 1

Number	Variables	N.o items	Cronbach's Alpha
1	RE	10	.943
2	BTC	2	.988

The data in Table 2 reveals that the environmental impact of food waste is strongly moderated by both perceived food healthiness and the physical attributes of accompanying peers. While healthy food choices (Granola) generated relatively low and stable levels of unconsumed waste (6.28 g to 11.54 g) across all experimental conditions, unhealthy options (M&Ms) exhibited extreme volatility in waste production (10.53 g to 18.58 g) and a disproportionately higher carbon footprint. Specifically, observing a thin companion select an unhealthy snack prompted participants to take the largest portion overall (55.08 g), yet only 36.50 g was actually eaten, yielding the highest unconsumed waste (18.58 g) and peak greenhouse gas emissions (59.46 g CO_{2e} per serving) nearly 5.9 times the footprint of healthy food consumed near an obese peer (10.05 g CO_{2e}). Conversely, observing an obese companion select an unhealthy option triggered a downward portion adjustment (31.86 g taken), significantly curbing unconsumed waste (10.53 g) and associated emissions (33.70 g CO_{2e}). This demonstrates that peer body type and food healthiness jointly govern waste-driven lifecycle emissions, with social permission mechanisms around thin peers selecting unhealthy foods posing the highest threat to environmental efficiency.

Table 2. Mean portion selection, consumption, organic waste, and estimated CO2e emissions per serving (Study 1)

Observed Condition	Food Option	Portion Taken (Mean, g)	Portion Eaten (Mean, g)	Unconsumed Waste (Mean, g)	Estimated Waste CO_{2e} (g CO_{2e})
Thin Confederate	Granola (Healthy)	46.15	34.61	11.54	18.46
Thin Confederate	M&Ms (Unhealthy)	55.08	36.50	18.58	59.46
Obese Confederate	Granola (Healthy)	47.21	40.93	6.28	10.05
Obese Confederate	M&Ms (Unhealthy)	31.86	21.33	10.53	33.70
Control (Alone)	Granola (Healthy)	46.50	39.87	6.63	10.61
Control (Alone)	M&Ms (Unhealthy)	46.98	32.18	14.80	47.36

3.2. Study 2: Portion quantity anchoring

The empirical results in Table 3 demonstrate a direct, non-linear relationship between peer portion anchoring, individual food choice, and downstream environmental degradation. While observing a peer select a large portion (30 candies) significantly increased the volume of food taken (M = 27.58 to 28.15 candies) relative to a small anchor (M = 6.32 to 7.45 candies) or eating alone (M = 16.76 candies), actual intake plateaued at 10.80 candies across both large-portion conditions. This decoupling of serving size from physiological consumption resulted in a severe accumulation of unconsumed organic waste (16.78 to 17.35 candies per participant). Because lifecycle environmental impacts are directly tied to discarded food volume (ΔW = Taken - Eaten), peer driven over portioning functioned as an environmental multiplier: exposure to a large portion anchor increased waste-related greenhouse gas emissions up to

27.5 fold compared to a small anchor (93.69 g CO_{2e} vs. 3.40 g CO_{2e}). Notably, while companion body type slightly influenced initial selection in the small-portion condition, consumed quantities remained identical across body types within each portion tier (5.69 candies for small; 10.80 candies for large), confirming that quantity anchoring rather than peer body type serves as the primary behavioral driver of lifecycle carbon emissions..

Table 3. Mean candy selection, consumption, organic waste count, and estimated CO_{2e} emissions per serving (Study 2)

Confederate Portion	Confederate Body	Candies Taken (Mean Count)	Candies Eaten (Mean Count)	Unconsumed Waste (Mean Count)	Estimated Waste CO_{2e} (g CO_{2e})
Small (2 Candies)	Thin	6.32	5.69	0.63	3.40
Small (2 Candies)	Obese	7.45	5.69	1.76	9.50
Large (30 Candies)	Thin	27.58	10.80	16.78	90.61
Large (30 Candies)	Obese	28.15	10.80	17.35	93.69
Control (Alone)	N/A	16.76	6.95	9.81	52.97

3.3. Study 3: Cognitive load & self-esteem interactions

Study 3 demonstrated strong internal reliability across restrained eating (α= .930), appearance self-esteem (α = .874), and Cognitive Load (α = .949), while establishing a negative correlation between Appearance Self-Esteem and BMI ($r = -.253$, $p < .001$). Hierarchical regression revealed main effects on portion selection from Appearance Self-Esteem ($B = .284$, $p < .001$) and observed body type ($B = .149$, $p = .018$), alongside significant two-way interactions for Body Type x Appearance Self-Esteem ($B = -.279$, $p < .001$) and body type x cognitive load ($B = .249$, $p = .001$). Specifically, participants under low cognitive load served larger portions near an obese person (M = 344.93 g) than a thin person (M = 316.58 g), whereas high cognitive load reversed this behavior, leading to larger portions near thin individuals (M = 378.00 g) than obese individuals (M = 295.31 g). Additionally, high appearance self-esteem increased portion choices around obese companions, while low self-esteem increased portions chosen near thin companions (Table 4).

Table 4. Mean ice cream portion selected in Study 3

Psychological Condition	Peer Body Type	Ice Cream Portion Selected (Mean Size, g)
Low Cognitive Load	Thin	316.58
Low Cognitive Load	Obese	344.93
High Cognitive Load	Thin	378.00
High Cognitive Load	Obese	295.31
Low Appearance Self-Esteem	Thin	361.46
Low Appearance Self-Esteem	Obese	257.51
High Appearance Self-Esteem	Thin	333.11
High Appearance Self-Esteem	Obese	382.73
Control (Alone)	N/A	305.94

3.4. Suggestions to enhance professional quality

To enhance the academic rigor and methodological alignment of this research prior to target journal submission, several key structural and analytical refinements should be integrated. First, environmental emission metrics should be standardized across all experimental empirical findings. While Section 2.6 introduces category-specific conversion factors (1.60 g CO_{2e}/g for Granola, 3.20 g CO_{2e}/g for M&Ms, and 5.40 g CO_{2e}/unit for confectionery items) based on established lifecycle models, embedding these emissions calculations directly into the primary results tables highlights the exact behavioral-to-environmental pipeline. Second, the sampling strategy requires clearer theoretical justification in Section 2.2. Studies 1 and 2 relied exclusively on female undergraduate cohorts (N = 238 each), whereas Study 3 evaluated a mixed-gender sample (N = 216). Explicitly framing female participant selection in the initial studies around higher baseline vulnerability to body-image social comparison processes (Myers & Crowther, 2009) clarifies this design choice, while the inclusion of male participants in Study 3 strengthens broader population validity. Third, section numbering inconsistencies such as the duplicate appearance should be resolved by consolidating LCA procedures under Section 2.6 and establishing for critical appraisal. Finally, practical interventions for foodservice operators in Vietnam should be expanded. F&B managers can leverage these findings by implementing structural choice architecture such as smaller standard plate sizes, individual tray pre-portioning, and visual menu anchoring to disrupt peer-driven over-selection and reduce preventable urban organic waste.

CONCLUSION

This research synthesizes behavioral decision theory with environmental life-cycle modeling to demonstrate how interpersonal dynamics shape food portion selection, actual consumption, and downstream ecological systems within Vietnam's rapidly expanding food and beverage sector. Across three experimental studies, the empirical findings establish that consumers rely heavily on peer portion choices as primary quantity anchors, yet systematically adjust their intake based on an observed peer's physical attributes, perceived food healthiness, and personal cognitive or self-esteem constraints. Specifically, social modeling triggers significant portion over selection particularly around thin peers or when observing large portion anchors resulting in up to 61% of selected food volume remaining unconsumed. By connecting individual behavioral choices with category-specific LCA paradigms (E_f = 1.60 to 5.40 g CO_{2e} per unit/gram), this study highlights the structural link between social portion anchoring and macro-level environmental degradation. Unconsumed food choices driven by peer modeling function as an environmental multiplier, increasing waste emissions up to 27.5 fold under large anchor conditions (93.69 g CO_{2e} vs. 3.40 g CO_{2e}) and directly accelerating municipal landfill burdens, localized methane releases, and upstream agricultural resource depletion. Addressing these dual challenges requires integrated interventions: F&B operators and policymakers must implement default portion controls, structural menu sizing, and targeted public health messaging that mitigate social over ordering heuristics while simultaneously dampening urban organic food loss and its corresponding greenhouse gas footprint.

DECLARATIONS

Data Availability Statement

The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

Consent to Participate

Informed consent was obtained from all individual participants included in the study prior to experimental participation.

Consent to Publish

Informed consent for publication was obtained from all individual participants included in the study.

Ethical Approval and Compliance

This study was approved by the Institutional Review Board of the Faculty of Business Administration at Ton Duc Thang University (Approval Ref: TDTU-FBA-ETH-2022). All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

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Competing Interests

The authors have no relevant financial or non-financial interests to disclose.

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