

Inter generational Transmission of Inertia: Sedentariness and Depression as Obesogenic Pathways in Mother-Daughter Dyads in Kerala, India



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ABSTRACT

Objective: To examine how sedentariness, depression, and feelings of inertia are transmitted across generations and function as obesogenic behavior in mother-daughter dyads.

Methods: Sequential explanatory mixed-methods. N=120 dyads completed surveys on sedentariness, interviews. ANGELO framework assessed environment. Intergenerational transmission was tested via correlation, mediation, and thematic analysis.

Results: 68.3% of mothers and 100% of daughters reported ≥ 8 h/day sitting. Strong intergenerational concordance was found for sedentariness $r=.56$, depression $r=.47$, and inertia $r=.61$, all $p<.001$. Three transmission pathways emerged: 1) Observational Modeling: daughters copied mothers' "resting" as stress-coping, 2) Affective Contagion: shared depressive inertia reduced motivation for activity, 3) Environmental Structuring: mothers created home environments favoring sitting/screen time. Mediation analysis: Maternal inertia $\rightarrow$ Daughter sedentariness $\rightarrow$ Emotional eating $\rightarrow$ Dyadic obesity. OR=8.92, 95%CI:3.8-20.9, $p<.001$

Conclusions: Inertia and sedentariness are intergenerationally transmitted psychiatric-behavioral patterns. Psychiatric rehabilitation must target dyadic behavioral activation to disrupt transmission, rather than individual weight loss.

Keywords: Intergenerational Transmission, Sedentariness, Inertia, Depression, Mother-Daughter Dyad, Obesity, Psychiatric Rehabilitation

Introduction

Obesity in Kerala clusters in families, but we know little about how the behavior is passed on. The concept of intergenerational transmission explains how patterns of coping, mood, and behavior move from parent to child through modeling, environment, and shared affect. Sedentariness is not just lack of exercise. It is a behavior with psychiatric meaning: a visible sign of depression, fatigue, and inertia. Inertia - the subjective feeling of "heaviness" and "no energy to move" - is a core feature of depression and a key barrier in psychiatric rehabilitation. In Kerala, cultural norms, academic pressure, and unsafe public spaces create conditions where mothers and daughters spend 8-10 hours/day sitting together. Over time, "sitting" becomes the default way to bond, to cope, and to rest. This study asks: Is sedentariness and inertia transmitted from mother to daughter, and does this transmission pathway explain dyadic obesity? From a psychiatric rehabilitation lens, if we can interrupt transmission, we can prevent obesity at its behavioral root. **METHODS**

Design This study used a sequential explanatory mixed-methods design [Creswell & Plano Clark, 2018]. In this design, quantitative data are collected and analyzed first, followed by qualitative data to explain and expand on the initial quantitative results. The purpose of using this approach was to first measure the extent of sedentariness, depression, and inertia in mother-daughter dyads, and then to understand how and why these patterns are transmitted across generations. The quantitative phase provided the prevalence rates and statistical associations, while the qualitative phase provided the lived experience and meaning behind those numbers. By integrating both, researcher is able to show not only that transmission occurs, but also the specific mechanisms through which it happens in daily family life.

Setting

The study was conducted in Thiruvananthapuram, Kochi, and Thrissur in the state of Kerala, India. These three cities were selected to represent different urban contexts within Kerala. Thiruvananthapuram is the state capital and a

government and educational hub. Kochi is a major commercial and port city with high exposure to screen-based work and modern lifestyles. Thrissur is a cultural and academic center with a mix of urban and semi-urban neighborhoods. Kerala was chosen because it has one of the highest rates of obesity and lifestyle diseases in India, despite high literacy and healthcare access. Within Kerala, women and girls also face specific cultural and environmental constraints to physical activity, such as limited safe public spaces and social norms that encourage staying indoors. By including three cities, we were able to capture variation in environment while still focusing on a shared cultural context where mother-daughter relationships are central to daily routines and health behaviors.

Participants

The sample consisted of N = 120 mother-daughter dyads recruited from Thiruvananthapuram, Kochi, and Thrissur in Kerala. Daughters were aged 15 to 18 years because this is a critical developmental period where health behaviors are established and obesity risk increases rapidly. Both mother and daughter had to be willing to participate together. Dyads where the mother was pregnant was excluded, or where either the mother or daughter had a chronic illness that limited mobility, such as arthritis, severe asthma, or physical disability. This was done to ensure that sedentariness was not solely due to medical restrictions. Dyads where the daughter was married or living outside the home, were also not included to maintain focus on co-resident mother-daughter relationships. Data saturation for the qualitative phase was reached with 24 dyads.

Measures

1. Sedentariness

Sedentariness was measured as the average number of hours per day spent sitting for activities such as watching television, using a phone, studying, and resting. Both mother and daughter reported this separately for weekdays and weekends. To capture the dyadic nature of the behavior, we calculated a Dyadic Concordance Score. This score reflected how similar the mother and daughter were in their daily sitting time. Higher scores indicated that both members spent a similar amount of time sitting.

2. Depression

Depressive symptoms were assessed using the Patient Health Questionnaire-9 (PHQ-9) for both mother and daughter. The PHQ-9 is a 9-item scale that measures frequency of depressive symptoms over the past 2 weeks. Scores of 10 and above indicate at least moderate depression. This tool was selected because it has been validated in Indian populations.

3. Inertia Scale

To measure feelings of inertia, we used a 5-item self-report scale developed for this study based on literature on behavioral activation and fatigue in depression. Items included statements such as "My body feels too heavy to move," "I have no energy to start activities," and "Even small tasks feel overwhelming." Responses were on a 5-point Likert scale. Higher scores indicated greater subjective inertia.

4. Transmission Index

Transmission Index was created to quantify how similar mothers and daughters were in daily routines. The index was a composite of three domains: similarity in daily routine, similarity in coping with stress, and similarity in food habits. For example, if both reported "sitting with phone after school/work" as their main way to relax, they received a higher score on that domain.

Qualitative Data Collection

In-depth interviews were conducted with 120 dyads selected purposively from the larger sample to represent high, moderate, and low levels of sedentariness. Each interview included both mother and daughter together. The central question was: "How did you learn to spend your free time?" Follow-up probes explored mood, motivation, family rules about activity, and shared habits. Interviews lasted 45-60 minutes and were audio-recorded and transcribed in Malayalam, then translated to English.

Environmental Assessment

ANGELO framework [Swinburn et al., 2011] to audit the obesogenic environment. Trained researchers rated each city on four domains: physical, economic, political, and socio-cultural. This helped us understand how home and community environments supported or discouraged movement for women and girls.

Data Analysis

Quantitative data were analyzed using R. Pearson correlation was used to test concordance between mothers and daughters on sedentariness, depression, and inertia. Mediation analysis was conducted to test the pathway: Maternal Inertia → Daughter Sedentariness → Daughter BMI. Qualitative data were analyzed using thematic analysis. We coded for mechanisms of transmission such as modeling, shared affect, and environmental structuring. Finally, we created a joint display table to integrate quantitative and qualitative findings. This allowed us to show how statistical associations were explained by participants' lived experiences. Ethical approval was obtained from

Institutional Ethics CommitteeWritten informed consent was taken from mothers and assent from daughters

RESULTS

Evidence of Intergenerational Transmission

Table 1. Evidence of Intergenerational Transmission (N=120 dyads)

Domain	Mother mean	Daughter mean	Within dyad correlation
Sitting hours / day	7.8	9.2	$r = .56^*$
PHQ 9 score	8.4	9.7	$r = .47^*$
Inertia score	3.2/5	3.5/5	$r = .61^*$
Emotional eating score	2.9/5	3.4/5	$r = .53^*$

Daughters reported significantly more sitting time than mothers, with 100% of daughters reporting ≥ 8 hours/day compared to 68.3% of mothers. The strongest correlation was found for inertia, $r = .61$, $p < .001$, suggesting that the subjective experience of "feeling too heavy to move" was shared strongly within dyads. Depression and emotional eating also showed moderate correlations, indicating that both mood and coping styles were transmitted.

Qualitative Themes: How Transmission Occurs

Thematic analysis of 120 dyad interviews revealed three primary mechanisms through which sedentariness and inertia were transmitted.

Theme 1: Observational Modeling of Inertia

"I saw Amma sit after work with tea and phone. So when I am tired from tuition I do the same. We don't talk, we just sit together" - Daughter, 14
Mothers taught daughters that "rest = sitting + screen". This was learned, not chosen.

Theme 2: Affective Contagion of Depression and Inertia

When mothers reported "I have no energy", daughters mirrored it within days. Shared low mood led to shared inactivity. *"If she is dull, I also become dull. Then both of us just lie down"* - Mother, 40

Theme 3: Environmental Structuring

Mothers controlled the home environment: TV on, snacks available, "study at desk". No space or permission for outdoor play for girls. ANGELO score:

To test for intergenerational transmission, we examined within-dyad correlations for key behavioral and psychological variables. As shown in Table 1, there was significant concordance between mothers and daughters across all domains

"Poor" in Physical and Political domains across all 3 cities.

Mediation Analysis: The Transmission Pathway to Obesity

We tested whether maternal inertia predicted daughter outcomes through a behavioral chain. The results supported a significant mediation model. Maternal Inertia $\rightarrow$ Daughter Sedentariness $\beta = .48 \rightarrow$ Emotional Eating $\beta = .39 \rightarrow$ Dyadic Obesity. The indirect effect was significant, 95% CI [.21, .58]. Overall, the model explained 42% of the variance in dyadic obesity. Dyads where both mother and daughter were sedentary and had high inertia had 8.92 times higher odds of obesity, 95% CI: 3.8-20.9, $p < .001$. This suggests that inertia is not just a symptom, but an active mechanism that drives obesogenic behavior across generations.

Mediation Model:

Maternal Inertia $\rightarrow$ Daughter Sedentariness $\beta = .48 \rightarrow$ Emotional Eating $\beta = .39 \rightarrow$ Dyadic Obesity. Indirect effect significant: 95% CI [.21, .58]. 42% of obesity variance explained by transmission pathway.

Table 2. Joint Display: How Transmission Becomes Obesogenic

To integrate quantitative and qualitative data, we created a joint display shown in Table 2. This table shows how the numbers are explained by lived experience and what this means for rehabilitation.

Quantitative Finding	Qualitative Explanation	Psychiatric Rehabilitation Implication
$r = .61$ for Inertia	"Inertia is our family language"	Target inertia directly using Behavioral Activation technique
100% daughters ≥ 8 h sitting	"Sitting is how we spend time together"	Replace 1 hour of sitting with 10-min shared dyadic movement
OR = 8.92 for dyadic obesity	"We eat when we feel bored sitting"	Interrupt the sit-eat-sleep loop with structured activity breaks

DISCUSSION

This study provides the first evidence that sedentariness and inertia are intergenerationally transmitted psychiatric behaviors in Indian mother-daughter dyads. Rather than viewing obesity as only a result of poor diet or lack of exercise, our findings suggest it is maintained by patterns of mood, motivation, and movement that are passed from mother to daughter over time. With $n = 120$ dyads, we found strong concordance in sitting time, depressive symptoms, and subjective inertia. This indicates that these are not individual problems. They are relational and learned

Transmission Occurs Through Three Mechanisms Consistent with social learning theory and research on parental influence on child health behavior [Birch & Davison, 2001], we identified three pathways through which sedentariness was transmitted.[Bandura][1977]

Modeling: Daughters watched and copied how their mothers coped with stress and fatigue. In most homes, "rest" was modeled as sitting with tea and a phone. Daughters described learning this without being told. They simply saw it as the normal way to relax after school or tuition.

Affect: Depression and low energy spread within the dyad. This is consistent with research on emotional contagion in close relationships. When mothers reported "I have no energy today," daughters often reported the same feeling within 24-48 hours. Shared low mood led to shared inactivity, which further reinforced low mood.

Environment: Mothers structured the home as a "sitting home." They controlled access to space, food, and activities. Televisions were on, snacks were available, and daughters were directed to sit and study. At the same time, there were few safe or socially acceptable spaces outside for girls to be active. The ANGELO audit confirmed that all three cities scored "Poor" in physical and political domains for women's activity. Thus, the environment both reflected and reinforced the behavior being modeled at home.

Inertia is the Active Ingredient A key finding is that inertia is the active ingredient linking depression to sedentariness and obesity. Inertia is not laziness or lack of willpower. In psychiatric rehabilitation, inertia is understood as a core symptom of depression and fatigue — a subjective feeling of heaviness and difficulty initiating movement [Demyttenaere et al., 2005]. When both mother and daughter experience inertia, it becomes normalized. Statements like "my body feels heavy" or "I'm too tired" were used by both generations to explain why they were sitting. Because both felt it,

neither challenged it. This created a feedback loop: inertia led to sitting, sitting led to more fatigue, and fatigue reinforced inertia. Breaking this loop requires treating inertia as a target of intervention, not as an excuse for not changing.

Implications for Psychiatric Rehabilitation

Current obesity programs in India focus heavily on diet plans and individual exercise prescriptions [Corrigan & Mueser, 2014]. However, this approach ignores the relational and psychiatric nature of the problem. Based on our findings, we propose Dyadic Behavioral Activation as the core intervention for psychiatric rehabilitation. This would include four components: Shared 10-minute walks: Instead of asking individuals to exercise alone, clinicians should prescribe short, shared movement to be done together. This directly targets inertia by making movement a relational activity rather than a chore

Cognitive work on inertia: Psycho education should address the belief "heavy feeling = cannot move." Patients can be taught that movement, even for 5-10 minutes, often reduces the feeling of heaviness. This reframes inertia as a signal to move, not to stop. Environmental rehabilitation: Clinicians and public health workers must advocate for women-only safe spaces for walking in Kerala. Without changes to the physical and political environment, behavior change at home will be limited.

Screen-time replacement: Rather than just reducing screen time, we should replace it. For every 1 hour of sitting, dyads can be asked to do 1 hour of shared activity per week. This could be cooking together, walking to the market, or dancing to music at home. By treating the dyad as the unit of intervention and inertia as the mechanism of change, psychiatric rehabilitation can disrupt the intergenerational transmission of obesity before it becomes entrenched.

Limitations include the cross-sectional design, which prevents causal claims. Future research should use longitudinal designs to test whether reducing maternal inertia leads to downstream reductions in daughter sedentariness and weight. Conclusion: Mothers in Kerala are transmitting more than genes. They are transmitting ways of coping, ways of feeling, and ways of moving. If we want to prevent obesity, psychiatric rehabilitation must target these transmitted patterns. Movement is not just for weight loss. It is for mood, for energy, and for breaking cycles that pass from one generation to the next

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