



Integrating Progressive Muscle Relaxation through mHealth: Conceptual Development of the “Relaxed Moms” Application for Stress and Anxiety Reduction in Primigravidae Mothers

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Abstract: Background: Pregnancy is a dynamic period marked by profound physiological, psychological, and social changes that can predispose expectant mothers—especially primigravidae—to stress and anxiety. Excessive prenatal stress adversely influences both maternal well-being and fetal outcomes.

Objective: This study explores the conceptual framework and significance of Progressive Muscle Relaxation (PMR) as a non-pharmacological strategy for stress reduction during pregnancy and presents the development of *Relaxed Moms*, a mobile health (mHealth) application designed to deliver guided PMR sessions and mindfulness-based interventions.

Methods: The conceptual model of the *Relaxed Moms* mobile application. A randomized clinical trial is proposed involving 200 primigravidae mothers, divided into experimental and control groups. The experimental group will use the *Relaxed Moms* mobile app for 10 weeks, while the control group will receive standard antenatal care. Stress and anxiety levels will be measured using the Stress Scale on Pregnancy and the Stirling Antenatal Anxiety Scale. Data will be analyzed using the unpaired t-test.

Results :It was found that the *Relaxed Moms* mobile app significantly reduced stress and anxiety among primigravidae mothers by integrating relaxed Moms Mobile application.

Conclusion: The integration of PMR through digital platforms offers a scalable, evidence-based, and accessible approach to enhancing maternal mental health. The *Relaxed Moms* mobile application represents an innovative pathway to bridge psychological and emotional well-being during pregnancy.

Key terms - Progressive Muscle Relaxation (PMR), Primigravidae, Maternal Mental Health, mHealth Applications, Pregnancy Stress, Anxiety, Relaxed Moms App

1. Introduction

Pregnancy, a period of extensive physical and emotional transformation, significantly influences a woman's psychological well-being. While physiological changes prepare the body to sustain fetal growth, the accompanying hormonal and psychosocial shifts can provoke stress, anxiety, and mood instability. The World Health Organization (WHO, 2008) recognizes maternal mental health as a vital component of reproductive health, with anxiety and depression affecting up to twice as many women as men globally. These conditions not only jeopardize maternal well-being but also have downstream effects on fetal development and child health.

In recent years, mobile health (mHealth) applications have emerged as powerful tools for promoting maternal health, offering accessible, cost-effective, and personalized interventions. The Relaxed Moms application aims to bridge the gap between clinical care and emotional support by integrating PMR and mindfulness-based stress reduction into daily routines for expectant mothers.

2. Literature Review

2.1 Psychological and Physiological Changes During Pregnancy

Pregnancy induces extensive adaptations across multiple systems—cardiovascular, endocrine, metabolic, and psychological. These adjustments, while essential for fetal development, often contribute to emotional fluctuations, anxiety, and sleep disturbances (Bjelica & Kapor-Stanulović, 2004). For primigravidae, these experiences are intensified by novelty, fear of childbirth (tokophobia), and shifting self-identity (Darvill, Skirton & Farrand, 2010).

2.2 The Stress Response and Maternal Health

The neuroendocrine system orchestrates the physiological stress response. Under chronic stress, prolonged elevation of cortisol and adrenaline may lead to maladaptive states—manifesting as fatigue, hyperglycemia, hypertension, or depressive symptoms (Christian, 2012). Sustained cortisol imbalance contributes to complications such as gestational diabetes and hyperemesis gravidarum (Leylek et al., 1999), while serotonin dysregulation has been associated with gestational depression (Shetty & Pathak, 2002).

2.3 Prevalence of Stress and Anxiety in Pregnancy

Studies reveal that up to 78% of pregnant women experience low to moderate stress, with approximately 6% facing severe anxiety (Sarah Woods Melville et al., 2010). Dumas et al. (2005) found higher stress levels among primigravidae (62.8%) compared to multigravidae (54.3%), emphasizing the need for early psychological interventions.

2.4 Impact of Maternal Stress on Fetal Outcomes

Chronic stress exposure during gestation is linked to adverse perinatal outcomes including low birth weight, preterm delivery, and impaired neurodevelopmental trajectories in offspring. Elevated maternal cortisol can cross the placenta, affecting fetal HPA (hypothalamic-pituitary-adrenal) axis regulation and increasing susceptibility to postnatal anxiety disorders.

3. Progressive Muscle Relaxation (PMR) as an Intervention

PMR, first introduced by Edmund Jacobson in the 1920s, involves the systematic tensing and releasing of specific muscle groups to cultivate body awareness and reduce physical tension. Empirical evidence supports PMR's efficacy in decreasing anxiety, improving sleep, stabilizing mood, and reducing somatic symptoms of stress.

During pregnancy, PMR provides a non-pharmacological, accessible, and safe means to manage physiological and emotional stress. By fostering parasympathetic nervous system activation, PMR reduces heart rate, blood pressure, and cortisol secretion, promoting both maternal relaxation and fetal calmness.

4. Digital Innovation in Maternal Mental Health

Mobile health (mHealth) solutions have revolutionized access to healthcare, particularly in maternal health contexts where time, cost, and stigma can limit care-seeking behavior. These platforms provide 24/7 access to evidence-based information and self-regulation tools, enabling women to monitor and manage stress autonomously. Studies indicate that digital interventions enhance user engagement, emotional resilience, and health literacy, particularly when content is personalized and culturally tailored.

5. The Relaxed Moms Mobile Application

5.1 Concept and Design

The Relaxed Moms app is conceptualized as a user-friendly, evidence-informed platform dedicated to enhancing psychological well-being among primigravid women. Unlike conventional maternal health apps that prioritize fetal development tracking, Relaxed Moms focuses on emotional health by integrating:

Guided PMR audio-visual sessions

Mindfulness and breathing exercises

Stress and mood tracking tools

Educational modules on pregnancy-related emotional changes

5.2 Features and Functionality

Personalized PMR Programs: Adjusted to gestational stage and stress levels.

Daily Mood Journal: Facilitates reflection and emotional self-awareness.

Mindfulness Library: Offers short meditations and affirmations for daily use.

Push Notifications: Gentle reminders to practice relaxation techniques.

Community Support Forum: Peer interaction moderated by healthcare professionals.

5.3 Theoretical Framework

The app's development is grounded in Cognitive Behavioral Theory (CBT) and Self-Determination Theory (SDT), emphasizing empowerment, self-efficacy, and autonomy in managing stress responses.

6. Proposed Methodology (for empirical validation)

6.1 Research Design

A Randomized clinical trial to assess the effectiveness of the Relaxed Moms mobile app.

6.2 Participants

Sample: 200 primigravidae mothers

Groups:

Experimental Group – Uses Relaxed Moms mobile application for 10 weeks

Control Group – Receives routine antenatal care only

6.3 Tools for Data Collection

- The *Stress Scale on Pregnancy* (based on **Calvin Hobel's Scale for Pregnancy Stress**) to assess the level of stress, and
- The *Stirling Antenatal Anxiety Scale* to assess the level of anxiety among primigravidae women.

Data Analysis

Un-paired T test to determine intervention effectiveness.

7. Discussion

Integrating PMR through mHealth technology provides a sustainable, scalable solution for addressing maternal mental health needs. The Relaxed Moms mobile app bridges gaps in conventional antenatal care by offering psychoeducation, self-management tools, and continuous emotional support. By promoting relaxation and mindfulness, it can mitigate anxiety, improve sleep quality, and enhance maternal-fetal bonding.

The intersection of technology and psychological science represents a pivotal advancement in personalized maternal healthcare, particularly in low-resource settings where access to mental health professionals remains limited.

8. Conclusion

Pregnancy-related stress poses substantial risks to both maternal and fetal health. Progressive Muscle Relaxation (PMR) stands as a proven, non-invasive strategy for managing these challenges. Through the Relaxed Moms mobile application, PMR can be made widely accessible, supporting maternal mental health in an engaging, evidence-based, and technologically innovative manner. Future empirical research should evaluate the app's efficacy and explore its integration into mainstream antenatal care programs.

The present study aimed to assess the effectiveness of "Relaxed Mom" mobile application on stress, anxiety amongst primigravidae. A randomized control trial design was adopted with 200 participants, allocated into a control group (n=100) and an experimental group (n=100).

Background profile of participants

Primigravida mothers Registered at OBG OPD GMC Handwara. Kashmir.

Table 1: Summary of Hypothesis Testing for the effectiveness of relaxed mom mobile application by Comparison Pre interventional and post interventional level of stress and anxiety among experimental and control group

STRESS							n=200
Stress	Group	Mean	Std. Deviation	T test	DF	Sig	Hypothesis Result
Pre-Interventional	Experimental	72.37	8.85	3.49	198	0.001	H ₀ rejected, H ₁ accepted
	Control	67.88	9.29				
Post-Interventional	Experimental	42.64	14.84	-19.44	198	0.001	
	Control	74.41	6.83				

ANXIETY							n=200
ANXIETY	Group	Mean	Std. Deviation	T TEST	DF	SIG	H ₀ rejected, H ₁ accepted
Pre-Interventional	Experimental	21.15	5.8	3.44	198	0.001	
	Control	18.58	4.7				
Post-Interventional	Experimental	8.97	3.9	-11.77	198	0.001	
	Control	16.69	5.3				

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