UNDERSTANDING THE IMPACT OF RECEIVING GRATITUDE AND GOAL ORIENTED NUDGES ON CHILDREN'S GROWTH

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TABLE OF CONTENT

LIST OF TABLES

CHAPTER II:

CHAPTER III:

LIST OF FIGURES

CHAPTER II:

CHAPTER III:

CHAPTER 1:
OVERVIEW OF DISSERTATION

"Motivation is the art of getting people to do what you want them to do because they want to do it." **- Dwight D. Eisenhower**

Individual behavior is shaped by external influences, such as rewards, fines or penalties; and internal motivations, such as personal values, desires, passion, and beliefs. For example, a child may avoid candy to evade reprimand from parents or from a passion to maintain a healthy lifestyle. Similarly, a person may engage in regular physical activity due to a work mandate or desire to remain healthy.

From ancient times, rewards and punishments have been used in societies to influence behavior. According to Operant Conditioning (Skinner, 1965), individual behavior is influenced by external factors like rewards and punishments. While rewards encourage continued behavior, punishments discourage it. This idea has been applied in several domains including educational, workplace, or social settings. For instance, students may study hard to achieve high grades or keep their room clean for reward of an allowance. In the workplace, a worker may work overtime for monetary compensation, or in a social setting, an individual may volunteer to gain public recognition. Conversely, a student may avoid plagiarism from fear of punishment by parents, while another may follow traffic rules to avoid penalty. A community member, on the other hand, may avoid littering to avoid social disapproval.

Although rewards and punishments are effective in shaping immediate behaviors, they fail to create long-term compliance due to their negative influence on internal motivation. Research also suggests that rewards and punishments undermine internal motivation. To demonstrate that rewards can negatively impact intrinsic motivation, two groups of students were asked to solve a puzzle across three sessions (Deci, 1971). In the first session, one of the groups received payment for each successfully completed puzzle, while the other group did not receive any reward. In the next session, neither group was paid to solve the puzzle. After the time was up, and participants were left alone for a while, the unpaid group continued working on the puzzle, clearly demonstrating that rewards can undermine internal motivation.

The Self-Determination Theory (SDT) was proposed by Deci & Ryan, (1985) arguing that autonomy, competence and relatedness are stronger motivators for encouraging desired behavior over the external factors of rewards and punishments. Accordingly, a child will perform better when they are in control of their learning. Although SDT is the foundational theory of internal motivation, other theories like Expectancy-value theory (EVT) (Eccles, 1983) and Social Cognitive Theory (SCT) (Bandura, 1986) argue for alternative drivers of behavior. EVT suggests that individual's expectations of success and perceived value of task are the key drivers of behavior, implying that children will engage more in activities they value (Eccles & Wigfield, 2002; Wigfield & Eccles, 2000). SCT stresses on learning and self-efficacy, implying that children with higher abilities and effort beliefs are more likely to

demonstrate improved performance. A more comprehensive perspective is offered by The Hierarchy of Needs (Maslow, 1943), which postulates that drivers of behavior advance through a series of requirements, starting with basic psychological and safety needs and ending with self-esteem and self-actualization.

Taken together, individual behavior is influenced by external factors and internal motivations. External factors can either undermine or support internal motivation. While external factors have shown to undermine internal motivation, research also shows that they can support internal motivations and the development of favorable behavior. External factors that address the need for autonomy, mastering, and purpose (Pink, 2009), can translate into desired behavior. As an example, teachers can provide students with autonomy through choice of topic, assessment format, and self-directed learning, leading to better educational outcomes (Reeve, 2009). Inculcating a growth mindset (Dweck, 2006; Sorensen, 2016), where children believe that their abilities can be developed through effort, has shown promising results in improving outcomes. At the workplace, aligning employees' sense of autonomy and purpose is yet another way to drive desired behavior through internal motivation. Organizations can satisfy the need of autonomy for employees by providing them greater flexibility in how they approach their task for higher productivity (Gagné & Deci, 2005).

Other external factors, like appreciation and behavioral nudges can also direct individuals toward desired behavior. Being appreciated enhances self-belief and social connectiveness, leading individuals to being more prosocial. On the other hand,

behavioral nudges when applied appropriately, make choice easier and accessible (Thaler & Sunstein, 2008), leading toward expected and desired behaviors. In this dissertation, I look at how receiving gratitude and behavioral nudges can be leveraged to support children's growth. Specifically, I look at how receiving gratitude can promote prosocial behavior in children and how sub-goal-oriented nudges can be used for improving their academic outcomes.

The selection of prosocial behavior and academic excellence is grounded in their importance for children's growth. Firstly, prosocial behavior, such as helping, sharing, and cooperating are essential for building social relationships and creating a harmonious and inclusive society (Lickona, 1992). Research shows that children with prosocial traits are more likely to be emotionally resilient, have a larger supportive peer network, contribute positively to their communities (Fehr & Fischbacher 2003; Fuligni, 2019; Luengo Kanacri et al. 2014), and achieve higher academic performance and wellbeing (Aknin et al., 2019). Additionally, academic excellence equips children with knowledge, critical thinking skills, problem-solving abilities, and intellectual curiosity, which are important for unlocking future opportunities. Academic excellence has shown to be linked to better life outcomes, such as higher education attainment, career prospects, and economic stability (Hattie, 2008). Together, development of prosociality and ensuring that children maximize their academic potential holds high significance as they can influence future outcomes. For example, a highly performing and empathetic child is likely to become a socially responsible leader.

Schools have rightfully prioritized values that promote social competence and academic excellence. When we look at the mission and purpose statement of most of the top schools, the focus toward development of these key traits is clearly evident. For example, the mission statement of one of the top schools in the UK reiterates the need to nurture students in a warm and friendly atmosphere to support their academic, cultural, and social development. Similarly, a school in the US pursues the highest ideals of scholarship by engaging students in a diverse and inclusive community, preparing them to lead lives of purpose.

Considering the importance of social competence and academic excellence, this dissertation addresses the following two questions: Can receiving gratitude promote prosocial behavior? Second, can behavioral informed nudges improve academic achievement? Taken together, these two essays look at the external factors that drive and also motivate reinforcement of desired behavior.

To address these questions, I carry out carefully designed field experiments with children in a school setting. The choice of this setting is compelling as schools play a crucial role in competency development. Beyond their home, children typically spend around 1500 hours per year and devising interventions that can foster competency development has considerable scope for real-time application and policy implication. A large number of interventions have been applied and tested with students and in school settings due to their transformational impact, including training and exercises, and norm setting, among others, with promising results. For example, mindfulness and reflective

training improves student's attention, wellbeing, and behavior (Phan et al., 2022). Additionally, studies have examined how external factors influence behavior rather than emphasizing on individually driven interventions (Chater & Loewenstein 2023).

This dissertation also addresses the call for transformative research that impacts children, an area that has largely been ignored. How external factors shape children's immediate behavior, including the long-term impact on life's success, thus, holds great significance. Childhood is an important development phase, associated with rapid physical and psychological transformation within a short span of time (Fabes et al., 1999). Often referred to as the period of 'storm and stress,' pre-adolescence and adolescence are particularly sensitive phases, marked by maturation of brain regions involved in processing skills (Mills et al., 2014). These stages are associated with heightened conflict, negativity, reactance, resistance, and defiance toward traditional social norms (Caissy, 1994). Given these developmental distinctions, especially in the cognitive and emotional domains, children's behavior needs to be examined within their own context rather than just extrapolation of adult findings to children. For example, Greif & Gleason (1980), found that children reciprocated politeness in exchange for a gift when prompted by parents compared to without the parental prompt, highlighting the role of external factors in shaping their behavior.

Recent research suggests that receiving gratitude, an externally driven experience, can motivate prosocial behavior (Grant & Dutton, 2012). However, research is limited on receiving gratitude and its impact on children. Likewise, discipline is

generally regarded as self-regulatory with internal motivation. However, not all children possess self-discipline necessitating external factors that can scaffold children with lower regulation and motivation. Can behavioral-informed interventions such as nudges be used in encouraging desired behavior, especially with children with lower self-disciple and motivation?

This dissertation is organized as follows: Essay 1 examines the role of two distinct forms of gratitude, expressing gratitude and receiving gratitude, on children's prosocial behavior. It also explores the mediating role of grit and self-esteem to explain the relationship between receiving gratitude and prosocial behavior. The second essay examines the role of nudging assignment completion and submission in improving academic performance, and the impact of nudges on academic performance for children with varied regulation (self-discipline), motivation (learning goal) and gender.

Essay 1: Prosocial behavior through Receiving Gratitude

Imagine a playground in school filled with activity, alive with fun and laughter. However, Lily is sitting alone. Ivan notices Lilly with tears in her eyes and offers her a toy. Moved by this gesture, Lilly expresses gratitude to Ivan. When children express gratitude for others' actions, like Lilly's expression of gratitude toward Ivan for his help, it encourages them to engage in prosocial behavior. Several studies in children have shown that expressing gratitude increases prosocial tendencies (Froh et al., 2008; Wood et al., 2010; Chaplin et al., 2019; Froh et al., 2009; Bono et al., 2019).

How would children be impacted if they knew that others were grateful for their actions? In our story, how would *receiving gratitude* from Lilly impact Ivan's subsequent prosocial behavior? While much of the past work has studied the impact of expression of gratitude on children, this essay examines how *receiving gratitude* impacts their prosocial behavior. Although comparatively less studied, existing research, which is almost exclusively with adults, shows that *receiving gratitude* also encourages prosocial behavior. In a field experiment, fundraisers who were thanked for their contributions, demonstrated increased voluntary effort (Grant & Dutton, 2012). Surprisingly, no study has examined how *receiving gratitude* affects children.

Through three carefully designed experiments, this study shows that *receiving gratitude* serves as a strong motivator for prosocial behavior. Across multiple dimensions of prosocial behavior that includes sharing, helping, and cooperating, and across a wide sample of children, the study demonstrates that *receiving gratitude* promotes higher prosocial intent and behavior compared to expressing gratitude. Additionally, persistence belief emerges as the mediating factor explaining the link between *receiving gratitude* and prosocial behavior.

The findings suggest that expressing gratitude is a strong motivator for prosocial behavior even in benefactors. Structured gratitude interventions that target benefactors, such as thanking benefactors for their contributions, can increase recurrent prosocial behavior like helping, volunteering, and donating. Schools and institutions can play an

important role by embedding such gratitude practices in their culture, thereby helping prosocial development.

Essay 2: Nudging for Academic Achievement

The second essay investigates how behaviorally informed nudges for assignment completion and submission can be used to enhance academic performance. Prior research has shown the effectiveness of nudges across various domains, including health, finance, sustainability, and law (Benartzi et al., 2017; DellaVigna, 2009; Diamond & Vartiainen, 2012; Hough, 2013; Sunstein, 1999; Thaler, 2005; Thaler & Sunstein, 2008; Lavecchia et al., 2016). By leveraging feedback, framing, grouping, and choice infrastructure, nudges have also shown to be effective in enhancing academic outcomes within educational settings (Apostolova-Mihaylova et al., 2015; Ariely & Wertenbroch, 2002; Bergman & Rogers, 2017; Burger et al., 2011; Carrell et al., 2011; Damgaard & Nielsen, 2018; De Paola & Scoppa, 2011; Fryer, 2016; Kraft & Levitt et al., 2016; McEvoy, 2016; Pugatch & Wilson, 2018; Rogers, 2015; Tuckman, 1998; Wagner, 2017). For example, messaging university students for their tutoring session increased attendance (Pugatch & Wilson, 2018), reminding students on critical deadlines increased financial aid registration (Castleman & Page, 2015), and updating parents improved homework completion and academic performance (Kraft & Rogers, 2015; Pugatch & Wilson, 2018).

This essay examines the effectiveness of sub-goal-oriented nudges for students to complete and submit their assignments, ultimately improving academic performance. In a field experiment that spanned over eight months, students preparing for a highly competitive examination were nudged to complete and submit their assignments. Empirical results show that sub-goal-oriented nudges significantly improved academic performance and were particularly beneficial to students with lower self-disciple and learning goal motivation. Also, male students benefitted more than female students, with their positive effect persisting even after the nudges stopped.

The findings from the two essays demonstrate the role of external factors (receiving gratitude and sub-goal-oriented nudges) in driving behavior. The results from these findings in real-world settings suggest the importance of school environmental design in driving desired behavior toward social competence and academic excellence. The findings are especially relevant in the present context, with an increasing trend toward online learning and schooling. Schools have always been and shall always be places where children are socialized and trained to develop skills required to navigate the complexities of modern life.

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CHAPTER II:

ESSAY 1: *RECEIVING GRATITUDE ENHANCES GRIT AND PROSOCIAL BEHAVIOR MORE THAN EXPRESSING GRATITUDE*

ABSTRACT

Gratitude has widely been recognized for fostering prosocial behavior and psychological well-being. However, prior research has predominantly focused on the benefits of *expressing gratitude*, while the impact of *receiving gratitude* is largely unexplored. This essay examines how *receiving gratitude* influences children's prosocial behavior. Across three field experiments involving elementary and middle school children, we compare the effects of *expressing gratitude* versus *receiving gratitude*. In Study 1, we find that children *receiving gratitude* exhibit significant greater gratitude and prosocial intent than those *expressing gratitude*. Study 2 replicates these findings using behavioral prosocial measures, showing that recipients of gratitude donate more resources and volunteer more time. In Study 3, a longitudinal experiment lasting 10 days, we explore the underlying mechanism and find that grit mediates the relationship between *receiving gratitude* and prosocial behavior, whereas self-esteem does not. These results challenge the conventional gratitude intervention that emphasizes expression, suggesting reinforcing children's actions through received gratitude may be a more effective approach in fostering gratitude and long-term prosocial behavior. The findings from this research have practical applications for educational intervention, parenting and caregiver practices, advocating to augment recognition-based approaches to enhance social cooperation and resilience in children.

Keywords: gratitude, prosocial behavior, grit, self-esteem, children, field experiment, behavioral reinforcement

INTRODUCTION

"The surest way to be happy is to seek happiness for others." **- Martin Luther King Jr.**

Prosocial behavior refers to voluntary actions intended to benefit others, such as helping, sharing, and cooperating (Eisenberg, 2000). It fosters social bonding, emotional well-being, and academic success while reducing delinquent behavior. These effects contribute to meaningful social engagement and the development of supportive communities (Fuligni, 2019 ; Fehr & Fischbacher, 2003; Luengo Kanacri et al., 2014). Children who exhibit prosocial tendencies enjoy higher self-esteem, greater peer acceptance, stronger relationship and friendships (Laible et al. 2004; Wentzel, 1993; Cillessen et al., 2005; Markiewicz et al., 2001; Zimmer et al., 2005; Layous et al., 2012). They also report greater life satisfaction, improved coping with adversity (Griese & Buhs, 2014; Martin & Huebner, 2007), reduced delinquency behavior and antisocial behavior (Carlo et al., 2014; Pursell et al., 2008) and greater academic success (Padilla et al., 2011).

Gratitude, an emotional response to receiving help or kindness (Emmons & McCullough, 2003), is widely regarded as a key driver for prosocial behavior. Studies show that individuals who practice gratitude tend to be more generous and have a greater prosocial behavior (Emmons & McCullough, 2003), and are more empathic and socially engaged (Bartlett & DeSteno, 2006; Tsang, 2006). Gratitude has also been linked to numerous benefits, including greater subjective well-being and happiness

(McCullough et al., 2002; Emmons & McCullough, 2003; McCullough et al., 2004; Seligman et al., 2005), stronger relationships (Algoe et al., 2008), better health through reduced stress and blood pressure (Wood et al., 2008; Jackowska et al., 2016), strengthened immune function (Emmons & Stern, 2013), improved quality of sleep (Emmons & McCullough, 2003; Wood et al., 2009), and healthier eating behavior (Wolfe & Patterson, 2017). Among children, gratitude has been linked to various positive outcomes, including higher prosocial behavior (Chaplin et al., 2019), higher self-esteem and greater life satisfaction (Froh et al., 2009), lower materialism (Chaplin et al., 2019) and reduced envy and depression (Lin, 2015; You et al., 2022).

However, most of the studies on gratitude focus on gratitude generated through *expressing gratitude* (thanking others). The effects of *receiving gratitude (*being thanked by others) remain understudied. Limited research with adults suggests that *expressing gratitude* has positive prosocial outcomes (Grant & Dutton, 2012). How would children be impacted if they knew that others were grateful for their actions? To date, no study has examined the benefits of *receiving gratitude* in children.

This essay fills this gap by comparing the impact of two types of gratitude – *receiving gratitude* and *expressing gratitude,* on children's gratitude and prosocial behavior. In addition, it provides causal evidence on effective ways to enhance prosocial responses, which remains limited (Spinrad & Gal, 2018). Finally, it investigates the underlying mechanism driving prosocial behavior, examining that

receiving gratitude reinforces past actions through persistence beliefs (grit) or through improved self-belief (self-esteem), thereby promoting greater prosocial engagement.

In summary, this essay explores the impact of two distinct types of gratitude and the role of grit and self-esteem in children and adolescence - a critical period known for the development of prosocial intentions (Carlo and Padilla-Walker, 2020; Toseeb et al., 2017). Early adolescence brings numerous transitions, spanning physical, hormonal, familial, relational, and educational changes within a relatively short period (Fabes et al., 1999) including development regions of brain that are involved in social processing (Mills et al., 2014). These changes, including those linked to puberty, increases social and emotional challenges. and is associated with increased conflict and negativity, including defiance (Caissy, 1994). Understanding how gratitude influences behavior during this stage is therefore essential.

CONCEPTUAL DEVELOPMENT

Understanding Gratitude

Gratitude is a complex and multifaceted concept. Gratitude has been conceptualized as an emotion, an attitude, a moral virtue, a habit, a personality trait or a coping response (McCullough et al., 2002). Gratitude is generally considered as a response by beneficiary to recognizing and appreciating a positive outcome that resulted from another's action, and has traditionally been defined as a generalized tendency to recognize and respond with grateful emotion to the roles of other people's

benevolence in the positive experiences and outcomes that one obtains (McCullough et al., 2002). This definition highlights gratitude as a cognitive appraisal and an emotional response to recognizing others' goodwill. People experience gratitude when they receive benefits from others (Tesser et al., 1968). Accordingly, most research has focused on how beneficiary express gratitude after receiving help, showing that expressing gratitude reinforces prosocial interactions and strengthens social bonds. However, gratitude is not only experienced by the beneficiary - those who receive benefits, but also by benefactor - those who are acknowledged and appreciated for their actions.

In the traditional *expressing gratitude* (thanking others for their help) perspective, when individuals recognize that another person's benevolence toward them, feel grateful, reinforcing reciprocity and prosocial motivations. However, when individuals *receive gratitude* (being appreciated for one's own helpful actions), it fosters positive emotion including strengthening one's sense of self-belief and social-worth (Fehr et al., 2017; Grant et al., 2008). This can make individuals feel competent and grateful, reinforcing prosocial behavior. This aligns with Bertocci & Millard (1963) broader definition of gratitude, which they describe as "the willingness to recognize the unearned increments of value in one's experience." This perspective expands gratitude beyond direct acts of benevolence, allowing for self-reflection arising from appreciation of positive outcomes, independent of benevolence as a source of gratitude. In the context of *receiving gratitude*, unearned increments of value could be the expression of

appreciation itself, rather than direct help or benefit. Therefore, receiving gratitude for one's actions can itself be a source of gratitude.

Expressing Gratitude (when children thank others)

Both *expressing gratitude* and *receiving gratitude* have shown to promote prosocial behavior. Research indicates that individuals who actively practice gratitude tend to be more generous, empathetic and socially engaged (Bartlett and DeSteno, 2006; Tsang, 2006). *Expressing gratitude* through counting blessings has been found to nurture prosocial behavior. Research has shown that practicing gratitude leads to individuals being more helpful (Emmons & McCullough, 2003). Similarly, Bartlett and DeSteno (2006) demonstrated that expressing gratitude increased prosocial behavior not only toward the benefactor but also strangers. The positive effects of expressing gratitude extends to children, Chaplin et al. (2019) found that children expressing gratitude were significantly more generous in their donations compared to the control group. Specifically, while children who expressed gratitude donated two-thirds of their earnings, compared to only half of their earnings in control condition.

Beyond prosocial behavior, expressing gratitude has been linked to various psychological and physiological benefits that include increased happiness and wellbeing, stronger social bonding and improved health. Emmons & McCullough (2003) found that participants assigned to expressing gratitude reported increased well-being across several outcome measures relative to the comparison groups. In another

study, Seligman et al. (2005) asked participant in the expressing gratitude group to write a gratitude letter to someone who has helped them but not been appropriately thanked. Those in the expressing gratitude condition, experienced greater happiness and reduced depression, with effects persisting for a month. Similarly, Algoe et al. (2008) found that expressing gratitude was associated with stronger relationship formation in a dormitory setting. Expressing gratitude also has measurable health benefits. A brief randomized controlled experiment by Jackowska et al. (2016) involving 119 young women, found that expressing gratitude improved cardiovascular and neuroendocrine function, and enhanced sleep quality. Other studies had linked expressing gratitude to improved sleep (Wood et al., 2009), increased positive state and exercise (Emmons & McCullough, 2003), reduced stress over time (Wood et al., 2008) and healthier eating behaviors (Wolfe & Patterson, 2017).

For children, *expressing gratitude* has been associated with emotional well-being, greater life satisfaction and lower materialism. In one study, Froh et. al. (2008) randomly assigned classrooms of students from grade 6th and 7th and found that students in the expressing gratitude condition exhibited greater optimism, higher life satisfaction, and reduced negative emotions. The effects on positive emotions strengthened over a two-week intervention and peaked three weeks later. Additionally, children in the expressing gratitude group also reported greater satisfaction with their school, feeling more competent, perceiving higher learning gains, and being more eager to attend school. In another intervention study, Froh et al. (2009) found that positive

affects lasted two month after the intervention, for children expressing gratitude. Expression of gratitude, has also shown to lower materialism (Chaplin et al., 2019) and reduced envy (Lin, 2015; You et al., 2022) in children.

Receiving Gratitude (when others thank you)

While gratitude is commonly associated with receiving help, research suggests that people can also experience gratitude when given an opportunity to help others (Fehr et al., 2017). For instance, Cheng et al. (2015) found that hospital staff identified assisting patients as a primary source of daily gratitude. Similarly, Grant et al. (2008) suggests that opportunities to help others provide psychological benefits, including fostering gratitude by enhancing employees' sense of fulfilment. Evidence though anecdotal, supports this assertion. For example, a florist expressed appreciation for the opportunity to guide customers in selecting bouquet (Bowe et al., 2009).

Research on receiving gratitude has primarily focused on adults, and findings show that receiving gratitude is associated with increase in self-beliefs and social worth. Grant & Gino (2010) found that individuals who helped others and received gratitude exhibited greater self-efficacy. In addition, studies also show that receiving gratitude can enhance sense of accomplishment, as seen in the case of nurses caring for patients (Stirling et al., 2023). When individuals receive gratitude, it contributes to the sense of self by affirming their value and their ability to impact others. The act of receiving gratitude can invoke feeling of gratitude as individuals recognize their worth through

the realization of positive impact of their actions. The study by Grant & Gino (2010) found that receiving gratitude increases an individual's perceived social worth. Since being connected to others is a fundamental human need (Baumeister & Leary, 1995), receiving gratitude strengthens this social connection. By satisfying individuals' need for social connectedness, receiving gratitude is likely to foster a sense of gratitude in the benefactor as well.

Receiving gratitude has also been shown to encourage continued prosocial behavior. For instance, fund raisers who received gratitude for their efforts demonstrated greater prosocial behavior (Grant & Gino, 2010). Field experiments in setting like kidney donations, volunteering for HIV/ Aids patients as well as clinicians visits have found that receiving gratitude increases donation (Bernstein & Simmons, 1974), volunteering (Bennett et al., 1996) and increased visits by case workers (Clark et al.,1988). Laboratory experiments too support this assertion (Clark, 1975; Goldman et al., 1982; McGovern et al., 1975; Moss & Page, 1972).

Receiving gratitude has shown to influence consumer behavior by reinforcing their behavior. Receiving gratitude in form of writing thankyou on restaurant bills resulted in increased amounts of tips offered to the servers (Rind & Bordia 1995). In yet another commercial setting, customers who received gratitude in the form of being thanked for prior purchases, were more likely to repeat their purchasers. A study on Wikipedia editors found that those who received gratitude for making contributions, were more likely to continue making edits than those who did not (Goel et al., 2019).

While there is growing evidence of the benefits of receiving gratitude in adults, little research has examined its influence on children. However, simply extrapolating adults' findings on children may not be appropriate due to the developmental differences. Gratitude is a complex emotion that typically emerges in children between the ages of 7 to 10, corresponding to the time when children develop reasoning skills (Froh et al., 2009). During childhood, numerous social and cognitive factors influence gratitude development, as children undergo developmental process and gradually acquire new skills. For instance, Greif & Gleason (1980), found that children were more likely to reciprocate politeness when prompted by their parents. While 86% of the children when prompted by their parents expressed gratitude, only 7% of children expressed gratitude spontaneously. Adolescence, due to the significant changes in the brain regions involved in social processing (Mills et al., 2014), is a critical development phase. This period is characterized by rapid physical, hormonal, and educational transitions within a relatively short timeframe (Fabes et al., 1999). Adolescence is associated with heightened conflict, reactance, resistance, and defiance toward social norms (Caissy, 1994). Given these distinctions, the impact of receiving gratitude on children should be examined within their own developmental context rather than assumed to mirror adult findings.

Mechanism to Receiving Gratitude and Prosocial Behavior

Grit. The concept of grit encompasses perseverance and passion for long-term goals (Duckworth et al., 2007) and is defined as perseverance and sustained passion for long-term goals, even amid adversity (Duckworth & Quinn, 2009; Duckworth et al., 2011). Previous research (Valdez et al., 2021) suggests that practicing gratitude contributes to the development of grit. In a pilot study, Sigmundsson & Hauge (2023) found that an online intervention reinforcing "I CAN" in university students enhances self-efficacy, well-being, and grit. This study shows that recognizing one's abilities can strengthen grit.

Receiving gratitude can increase grit, and the following two mechanisms can explain the development of grit. First, receiving gratitude can promote persistence beliefs through positive reinforcement of past actions, thereby allowing individuals to persevere in their efforts. When individuals repeatedly receive gratitude for their past actions, the positive outcomes observed act as a reinforcer for similar actions. This perhaps explains why customers repeat their purchases when thanked (Carey et al., 1976) and Wikipedia editors who received gratitude are more likely to make edits (Goel et al., 2019). Second, receiving gratitude can foster consistency of interest by making an individual more passionate about themselves and their actions. The tangible differences that individuals observe over time instils a sense of accomplishment and determination and resolve to persist even if the task requires additional effort or sacrifice. As receiving gratitude repeatedly reinforces positive actions, commitment to prosocial efforts

grows. This aligns with the components of grit - perseverance and passion for long-term goals, strengthening their ability to persist on tasks.

Although limited, recent research reveals a positive correlation between grit and prosocial behavior. In a study by Sreelakshmi & John (2023) among nursing students, grit correlated with their prosocial behavior. Grit has also been associated with reduced unethical conduct and job-related stress in workplace (Schwepker & Good, 2022), which should indirectly influence prosocial behavior. Moreover, across the lifespan, Wenner & Randall (2016) observed that older adults with higher grit scores engaged more frequently in prosocial acts. Similarly, Feldman & Freitas (2016) reported that grit predicted positive habits in selected US university students.

In summary, we propose that grit mediates the relationship between gratitude and prosocial behavior, a hypothesis we aim to test in our current study. Given that being valued and supported enhances an individual's sense of passion and perseverance towards tasks requiring effort and sacrifice - attributes encapsulated by the concept of grit (Duckworth et al. 2007), we predict that receiving gratitude from others' fosters greater grit in students, subsequently enhancing their inclination to prosocial behavior.

Self Esteem. An alternative mechanism we consider is that receiving gratitude can foster prosocial behavior by improving recipients' self-belief which can then lead to their prosocial behavior. Self-esteem is one's general sense of his or her value or worth (Rosenberg, 1979). Research indicates that individuals with higher self-esteem tend to invest more time and energy in various activities including in making financial

decisions (Chatterjee et al., 2008). The same should also be true with prosocial activities. Receiving gratitude provides the necessary feedback to helpers of the impact of their actions, increasing confidence (Ryan & Deci, 2000), removing any uncertainty and improving individuals' self-belief. Research has shown that merely helping others leads to improved self-esteem. For example, Weinstein & Ryan (2010) found helpers experienced an improvement in self-esteem when engaged in acts of assistance. Similarly, participants who spent money to benefit others reported higher self-esteem (Klein, 2017). We expect that similar should also be in case of receiving gratitude resulting in greater self-esteem. Furthermore, with this increased sense of self-esteem, helpers should feel a greater sense of willingness to provide help because of the confidence that their actions matter, motivating them to help others. Thus, we propose that receiving gratitude should increase helpers' self-esteem, which motivates helpers to engage in prosocial behavior.

OVERVIEW OF STUDIES

STUDY 1

Method

Participants. Participants were school children from grades 3 to 7 in a school in India (M_{age}= 9.89; SD = 1.536; 52% male). They were randomly assigned to one of two groups: the *expressing gratitude* condition or the *receiving gratitude* condition. Ethical approval was obtained from the Institutional Review Board (IRB), and consent was

secured from the participants' parents or guardians. The children also provided their assent to participate in the study. From an initial pool of 208 eligible students, 15 were absent or opted out, resulting in a final sample of 193 children (101 were boys and 92 girls).

Procedure. The study was conducted during regular school hours. Entire classrooms of students from grades 3 through 7 were randomly assigned to one of two intervention conditions: *expressing gratitude* or *receiving gratitude*. For instance, one classroom from each grade (e.g., Grade 3, Grade 4, and so on) was assigned to the *expressing gratitude* condition, while another classroom from the same grades was assigned to the *receiving gratitude* condition. This approach ensured that each classroom participated in only one condition, maintaining consistency and minimizing the risk of cross-contamination between groups. To preserve anonymity, each participant was assigned a unique identification code by their teacher, which was pre-written on survey sheets before data collection. At the start of the study session, the class teacher explained the purpose of the study and emphasized the importance of providing honest and thoughtful responses. The teacher assured the students that their responses would remain anonymous and would not be graded, which helped create a comfortable environment for participation.

In the *expressing gratitude* condition, children were asked to reflect on things they felt thankful, grateful, or appreciative for and to write these reflections, including

how they made them feel. In the *receiving gratitude* condition, each child received a personalized appreciation note from their teacher, highlighting specific actions or qualities that the teacher was grateful for in the child. Children in this condition were then instructed to reflect on the note's content and write about how receiving it made them feel.

After the reflection task, children completed a questionnaire designed to assess gratitude and prosocial intent. To ensure the questions were developmentally and culturally appropriate for the participants, a panel of teachers reviewed and approved them prior to the study. Gratitude was assessed by asking students to respond to three items: "How grateful do you feel right now?", "How thankful do you feel right now?", and "How appreciative do you feel right now?" Responses were recorded on a five-point scale ranging from 1 (*not at all*) to 5 (*extremely*). We averaged the scores across the three items as a measure of self-reported gratitude (α =.72).

Prosocial intent was measured using five hypothetical scenarios adapted from prior research (e.g. Jami et al., 2021; Touré-Tillery & Light, 2018). These scenarios described opportunities for children to engage in prosocial behavior and assessed their likelihood of participating. For example, one scenario asked, *"Imagine you see a new student sitting alone on the playground during recess. Would you go over and invite them to join a game with you and your friends?"* Children rated their likelihood of engaging in each behavior on a five-point scale, from 1 (*absolutely not*) to 5 (*absolutely*

yes) (See Appendix for all five scenarios). A composite average of responses across the scenarios served as our dependent variable.

Results.

We controlled for age and gender in our analysis in the first study and all subsequent studies, considering cognitive differences across age groups (Wood et al., 2004) and the influence of gender (Froh, et al., 2009).

Gratitude. Results revealed a significant difference in self-reported gratitude between the two conditions, with children in the *receiving gratitude* condition reporting significantly higher levels of gratitude compared to those in the *expressing gratitude* condition ($M_{receiving}$ = 3.93, SD = .82 vs. $M_{expressing}$ = 3.68, SD = .84; t = 2.319, p = .021). This finding is consistent with our predictions and confirmed that children in the *receiving gratitude* condition felt more grateful than children in the *expressing gratitude* condition.

Prosocial tendencies. Results revealed a significant difference between the two groups. Consistent with our predictions, children in the *receiving gratitude* condition demonstrated significantly greater prosocial intent compared to children in the *expressing gratitude* condition ($M_{receiving}$ = 4.42, SD = .47 vs. $M_{expressing}$ = 4.13, SD = .57; t = 4.108, $p < .001$). These results support our hypothesis that *receiving gratitude* fosters stronger prosocial tendencies than expressing gratitude, underscoring the unique

motivational role of being the recipient of gratitude in promoting positive social behaviors.

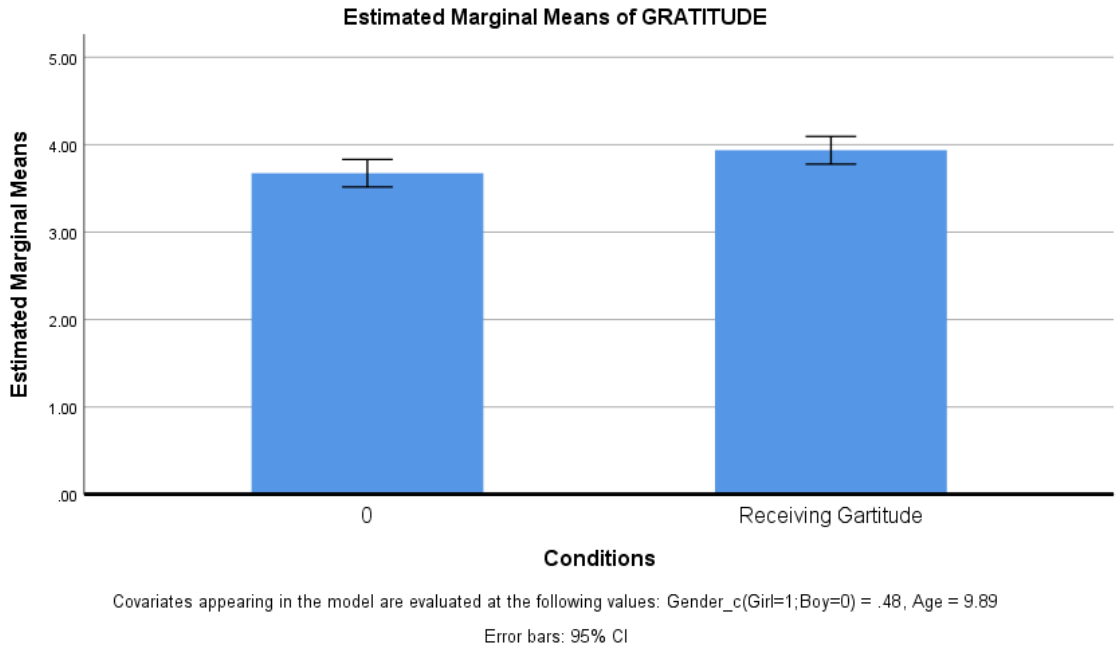

Figure 1: Effect of receiving and expressing gratitude on gratitude (Study 1)

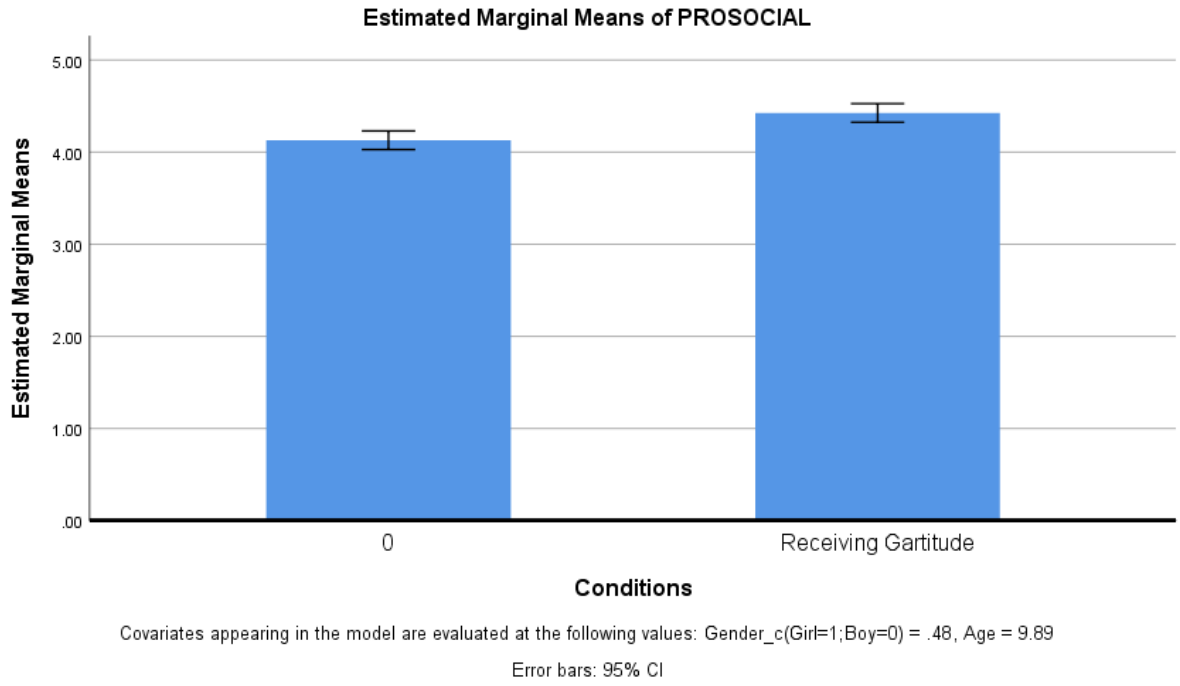

Figure 2: Effect of receiving and expressing gratitude on prosocial intent (Study 1)

Dependent Variable	Expressing Gratitude	Receiving Gratitude	F
Gratitude	3.67 (.080)	3.93 (.080)	5.376 (1,189) p=.044
Prosocial Intent	4.13 (.051)	4.42 (.051)	16.877 (1,189) p<.001

Note: The values under the conditions represent estimated means. The number in the parentheses next to the means represents the standard error. The values adjacent to the F's represent the degree of freedom.

Table 1: Comparison of expressing and receiving gratitude by measure of gratitude and prosocial intent (Study 1)

Discussion

The findings from this study highlight the unique impact of *receiving gratitude* on children's prosocial tendencies. Consistent with our framework, children in the

receiving gratitude condition reported higher levels of gratitude and demonstrated greater prosocial intent compared to those in the *expressing gratitude* condition. These results suggest that being the recipient of gratitude may serve as a stronger motivator for prosocial behavior.

STUDY 2

Study 2 builds on the findings of Study 1 by examining the effects of receiving versus expressing gratitude in a new relational context - peer-to-peer interactions, rather than teacher-student exchanges. This variation allows us to explore how the source of gratitude influences its impact, enhancing the generalizability of the findings. Additionally, Study 2 moves beyond self-reported prosocial intent by incorporating objective behavioral measures to capture real-world manifestations of prosociality and sustained effort. By introducing these methodological advancements, Study 2 provides a deeper understanding of how gratitude shapes prosocial behaviors, offering a more comprehensive perspective on the social and motivational effects of gratitude.

Method

The participants were children, from another school in India, having a higher enrolment than the school in Study 1, in grades 3 through 7 (M_{age}= 10.15; SD = 1.469; 50.3% male). They were randomly assigned to one of two conditions: *expressing*

gratitude or *receiving gratitude*. Ethical approval was obtained from the IRB, along with parental/guardian consent and participant assent. A total of 431 students participated in the study, comprising 217 boys and 214 girls.

Procedure. The study was conducted during regular school hours. At the outset, the teacher introduced the procedure, emphasizing that participation was voluntary, the responses would remain confidential, and the activity was not graded. Students in the *expressing gratitude* condition were instructed to write a gratitude note for a pre-assigned classmate, following guidelines adapted from prior research (Lyubomirsky et al., 2011). The instruction read: *"There are many times when your classmates would have helped you. You might feel thankful/grateful/appreciative towards your classmates for what they have done. Against the classmate mentioned below, could you think about what your classmate did that you are thankful/grateful/appreciative and how it has helped you?"* After children completed their notes, the teacher delivered them to the intended recipients. Assigning each student a specific classmate ensured practical feasibility and fairness, preventing favouritism or exclusion while guaranteeing that every participant had both a recipient and a note written for them. After completing their gratitude note, students in the *expressing gratitude* condition worked on a filler task, which asked them to identify adjective, verb and noun in a short paragraph. In the meanwhile, their peers in the *receiving gratitude* condition engaged with the notes they had been given.

Children in the *receiving gratitude* condition began with a filler task, which was same as earlier, while their classmates in the *expressing gratitude* condition wrote notes of appreciation. Once distributed, they were asked to read and reflect on the content of the note they received. The instructions stated: *"The given flashcard has one of your classmates expressing being thankful/grateful/appreciative for something you did. Please take a few minutes to think about what they are thankful/grateful/appreciative for."* Children were then asked to write a response explaining what they had done that made their classmate feel appreciative, reflecting on the specific actions mentioned and why those actions might have been meaningful. This structure ensured that both groups participated in a written activity, with one group focusing on *expressing gratitude* and the other on *receiving gratitude* and responding to it. After completing these tasks, all participants completed a survey designed to measure gratitude and prosocial behavior. The same three items measure of gratitude was used as in Study 1 (α =.76).

Prosocial behavior. Prosocial behavior was assessed through two behavioral tasks. In the first task, participants were informed that they would receive four notepads as a reward for their participation. They were then given the option to donate any number of these notepads to children in need, described as children from underprivileged backgrounds who lacked access to basic school supplies. Thus, each participant could choose to donate anywhere from 0 (keeping all four) to all 4 (keeping none) notepads with response from 1 (*0 to donate and 4 to self*) to 5 (*4 to donate and 0*

to self). The response served as a key dependent variable, reflecting the participants' generosity and willingness to help others in need.

In the second task, prosociality was measured by assessing children's willingness to volunteer their time and effort, building on prior research that identifies volunteering as a reliable indicator of prosocial behavior (Clary et al., 1998). This task was designed to capture real-world expressions of prosociality by evaluating participants' readiness to engage in effortful actions to benefit others. To ensure children understood the task, they were first asked to copy the sentence five times: *"The sun rises in the east and sets in the west. Today the sun is expected to rise at 6:00 AM and set at 6:30 PM."* After completing this initial activity, participants were informed that they could volunteer to complete the same task during their lunch period for up to 10 days. They then indicated the number of lunch periods they were willing to commit to, ranging from 0 to 10. This design provided a concrete measure of prosocial behavior by evaluating the children's willingness to dedicate time and effort to assist the researchers.

Results

We first examined the impact of the writing tasks on feelings of gratitude. Since age and grade could potentially moderate the effect of the intervention due to the difference in the cognitive development between the age group and gender, we controlled gender and age (Wood et al., 2004; Froh, et al., 2009). Consistent with our predictions and the findings from Study 1, results revealed a significant difference in

gratitude between the two conditions. Children in the *receiving gratitude* condition reported significantly higher levels of gratitude compared to those in the expressing gratitude condition ($M_{receiving}$ *= 3.74, SD = .87 vs.* $M_{expressing}$ *= 3.58, SD = .88; t = 1.983,* $p < .048$). This finding supports our hypothesis and confirms that receiving gratitude elicited stronger feelings of gratitude than expressing it.

Prosocial behavior. We next examined the two tasks designed to assess prosocial behavior among children. In the first task, which involved donating notepads, children in the *receiving gratitude* condition donated significantly more notepads than those in the *expressing gratitude* condition ($M_{receiving}$ *= 3.68, SD = .97 vs.* $M_{expressing}$ *= 3.34 SD = 1.00; t = 3.539,* $p < .001$).

Similarly, in the second task, which measured willingness to volunteer, children in the *receiving gratitude* condition were more willing to commit their time compared to children in the *expressing gratitude* condition ($M_{receiving}$ *= 3.50, SD = 2.70 vs.* $M_{expressing}$ *= 2.73, SD = 2.44; t = 3.081,* $p = .002$). Together, these findings from two distinct measures of prosocial behavior align with our predictions and demonstrate that receiving gratitude fosters greater prosocial behavior than expressing gratitude among children.

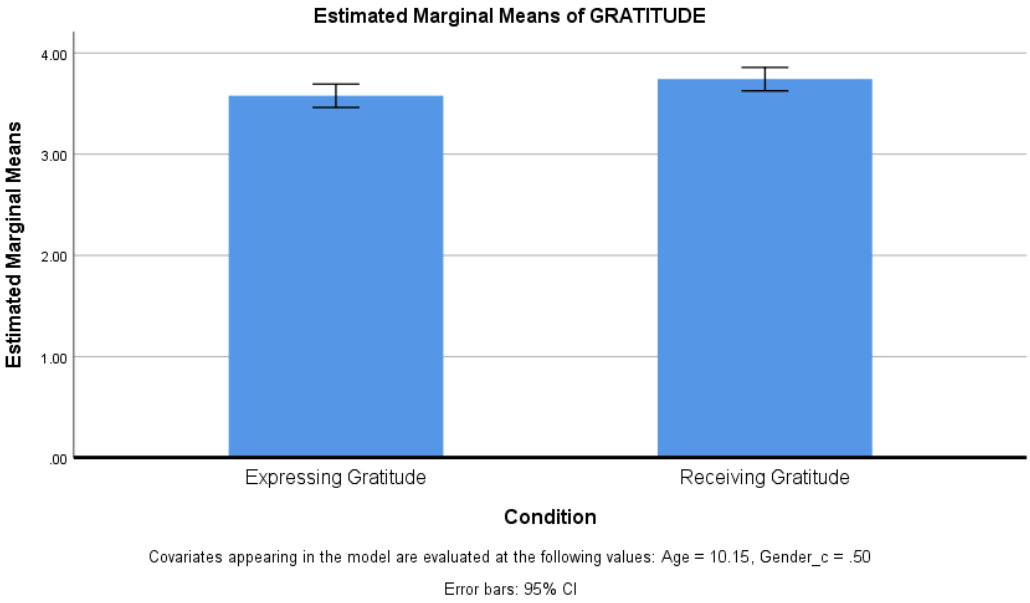

Figure 3: Effect of receiving and expressing gratitude on gratitude (Study 2)

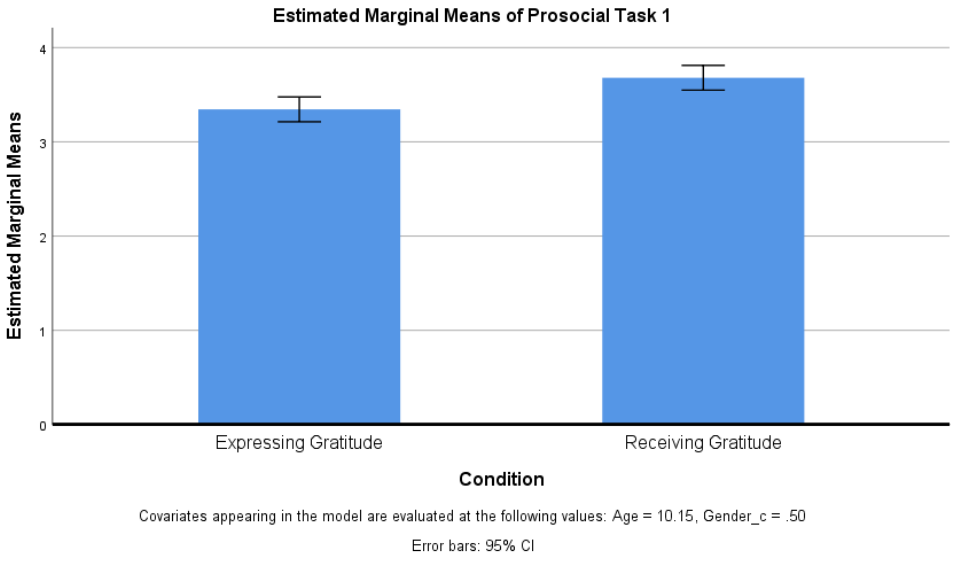

Figure 4: Effect of receiving and expressing gratitude on prosocial task 1 (Study 2)

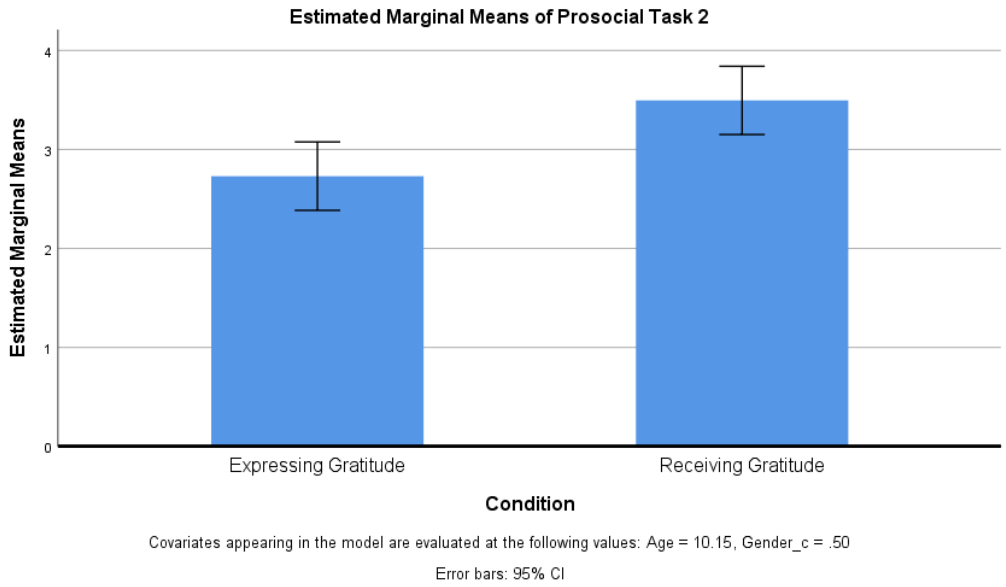

Figure 5: Effect of receiving and expressing gratitude on prosocial task 2 (Study 2)

Dependent Variable	Expressing Gratitude	Receiving Gratitude	F
Gratitude	3.577 (.059)	3.742 (.059)	3.934 (1,427) p=.048
Prosocial (Task 1)	3.345 (.067)	3.680 (.067)	12.527 (1,427) p<.001
Prosocial (Task 2)	2.730 (.176)	3.495 (.175)	9.490 (1,427) p=.002

Note: The values under the conditions represent estimated means. The number in the parentheses next to the means represents the standard error. The values adjacent to the F's represent the degree of freedom.

Table 2: Comparison of receiving and expressing gratitude by measure of gratitude and prosocial behavior (Study 2)

Discussion

Study 2 extends the findings from Study 1 by examining how *receiving gratitude* versus *expressing gratitude* impacts prosocial behavior in children. The results confirmed our predictions, with children in the *receiving gratitude* condition displaying significantly higher levels of gratitude and engaging in more prosocial behavior than those in the *expressing gratitude* condition. This was evident in both the prosocial task, where children in the *receiving gratitude* condition donated more notepads, and the volunteering task, where they also demonstrated greater willingness to commit their time. These findings suggest that *receiving gratitude* may be a more effective driver of prosocial behavior than expressing it, highlighting the powerful role that being the recipient of gratitude can play in fostering positive social actions.

STUDY 3

This study explores the effects of *receiving gratitude* on children's prosocial behavior through a ten-day journal-writing intervention. Building on the findings from Studies 1 and 2, which highlighted the positive impact of gratitude on prosocial behavior, this study extends the research by examining how a sustained reflection on gratitude influences behavior over time. By incorporating both gratitude expression and receipt as well as control, and measuring potential mediators like grit and self-esteem,

this study aims to provide a deeper understanding of how gratitude can shape long-term prosocial actions in children, further expanding the scope of previous findings.

Method

Participants. We conducted a field study with 627 school students in India (M_{age}*= 10.58; SD = 1.377; 52% males*) as part of an extracurricular class activity spread over 10 teaching days. 28 class sections from grades 4 to 8, aged 8 to 14, were randomly assigned to one of three conditions (*receiving gratitude, expressing gratitude* and *control*). Ethical approval was obtained from the IRB and guardian/ parental consent was secured along with participating children's assent for the study.

The distribution of students across conditions was nearly equal (*receiving gratitude*: *n= 212*; *expressing gratitude*: *n = 207;* and control: *n= 209*). We specifically tasked certain students with writing gratitude notes to their friends (*n = 209*) during the pre-experimental study. Although these students actively participated in the study, their responses were not included in the three main conditions.

Procedure. We conducted a field experiment over the course of ten days, utilizing a journal-writing method based on prior research (Emmons & McCullough, 2003; Seligman et al., 2005). Children were randomly assigned to one of three conditions: *expressing gratitude*, *receiving gratitude*, or a *control* condition. Children in the *expressing gratitude* group were asked to maintain journals in which they reflected on their own experiences of expressing gratitude, writing about moments when they

actively expressed thanks to others. Meanwhile, children in the receiving gratitude group journaled about instances where they received gratitude from classmates or teachers, reflecting on how these gestures made them feel. In contrast, the control group was asked to write about enjoyable experiences that had no connection to gratitude, allowing for a clear between-subjects comparison. This design helped to isolate the effects of receiving and expressing gratitude from other positive experiences, providing a more stringent test of gratitude's impact on subsequent behavior. Additionally, the inclusion of control helped in allowing for understanding of the mechanism behind the link of receiving gratitude and prosocial behavior.

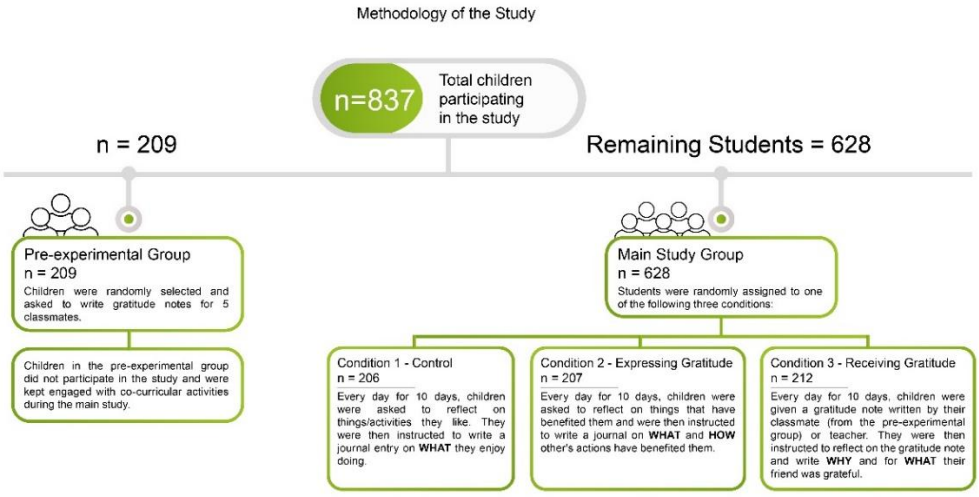

Figure 6: Depiction of the methodology used in the Study 3

Pre-experimental setup. To prepare for the main study, ten gratitude notes were collected for each child in the receiving gratitude condition, written by classmates or teachers. A separate group of students (*n=209*) was randomly selected to write these gratitude notes, focusing on specific actions or support their peers had provided. The prompts encouraged students to reflect on instances when they felt grateful for their classmates' actions, with the following instruction: *"Think about times when your classmates have helped or supported you. Reflect on each classmate mentioned in the note and consider what they did that you appreciate or feel thankful for, and how their actions positively impacted you."* Teachers were also asked to write gratitude notes, acknowledging when students had helped them, following a similar prompt. This pre-experimental phase ensured that each child in the receiving gratitude condition received personalized gratitude notes, which were distributed during the main study as part of the gratitude manipulation.

Main Study. In the main study, children participated in a journal writing exercise as part of an extracurricular class activity, conducted over the course of ten school days. This activity was completed daily, with children engaging in the exercise each day during the ten-day period. As mentioned earlier, students were randomly assigned to one of three conditions: control, expressing gratitude, and receiving gratitude. Participants in the control group were asked to write about an activity, person, or place they liked. The prompt encouraged them to reflect on things they enjoy, such as hobbies, programs, games, people, places, or characters. Children in the expressing

gratitude condition were asked to self-reflect and write about things they were thankful for. Finally, children in the receiving gratitude condition received a daily gratitude note from the pre-study and were asked to reflect on the specific actions that prompted gratitude from their classmates or teachers and write about them. Each student was given ten minutes to complete the journal writing task each day.

Measures

On the final day of the study, participants completed measures accessing gratitude, prosocial behavior, self-esteem, and grit.

Gratitude. Gratitude was measured through the empirically validated scale: Gratitude Questionnaire -5 (GQ-5) (Froh et al., 2011). GQ-5 comprises of five items and assesses the extent of being grateful. Example items include: *"If I had to make a list of things I am thankful for, it would be a very long list", "I have a lot to be thankful for"*. Participants' responses were captured on a 7-point Likert scale (*1=strongly disagree to 7=strongly agree*) (See Appendix for all five items). Gratitude in the GQ-5 scale was determined by averaging the responses across the five questions into a composite measure (α =.68).

Prosocial behavior. Prosocial behavior was measured using the social behavioral scale task (Knight & Kagan, 1977). Children were informed that they would receive three tokens as a reward for their participation, which they could exchange for a pen or pencil of their choice. In addition to the three tokens they received, children also

had the option to allocate between one and four tokens to a friend in the class. Thus, each participant was guaranteed three tokens for themselves regardless, they could give up to four tokens to others. The number of tokens a child decided to give was used as the dependent variable for prosocial behavior, with a higher number of tokens indicating greater altruistic behavior.

Grit. Grit was assessed using an adapted version of the eight-item Grit–S Scale (Duckworth & Quinn 2009), modified for children (Alan et al., 2019). An example item is: *"I prefer easy homework where I can easily answer all questions correctly."* Responses were measured on a 4-point Likert scale (*1 =completely disagree to 4 =completely agree*) (See Appendix for all eight items). The internal consistency (α = .68) showed acceptable reliability.

Self-Esteem. Self-esteem was assessed using the ten-item scale developed by Winch and Rosenberg (1965). Participants indicated their agreement with statements such as "*On the whole, I am satisfied with myself"* and "*I feel that I'm a person of worth, at least on an equal plane with others,"* using a 4-point Likert scale (*1 = strongly disagree to 4 = strongly agree*) (See Appendix for all ten items). An average of the ten items served as our self-esteem measures (α = .77).

Results

We first examined the impact of the writing tasks on feelings of gratitude. Since age and grade could potentially moderate the effect of the intervention due to the

difference in the cognitive development between the age group and gender, we controlled gender and age (Wood et al., 2004; Froh, et al., 2009).

Gratitude. Consistent with our predictions and the findings from Study 1 and Study 2, results revealed a significant difference in gratitude between the conditions. A significant main effect was observed for gratitude measured through GQ-5; (*F(2,561) = 6.806, MSE = 8.078, p = .001, η2 = .024*). Post hoc analysis revealed a significant difference of gratitude in the receiving gratitude compared to the expressing gratitude group ($M_{receiving}$ *= 5.22 vs.* $M_{expressing}$ *= 4.86, F(1,373) = 12.462, MSE =13.021, p < .001, η2 = .032*). We also observed significant difference in gratitude between receiving gratitude and control group ($M_{receiving}$ *= 5.22 vs.* $M_{control}$ *= 4.90, F (1, 375) = 7.950, MSE = 10.258, p = .005, η2 = .021*). We however did not observe any significant difference between expressing gratitude and control (*p=.672*). The results support the validity of our hypothesis since we observed greater gratitude for the receiving gratitude compared to expressing gratitude and control.

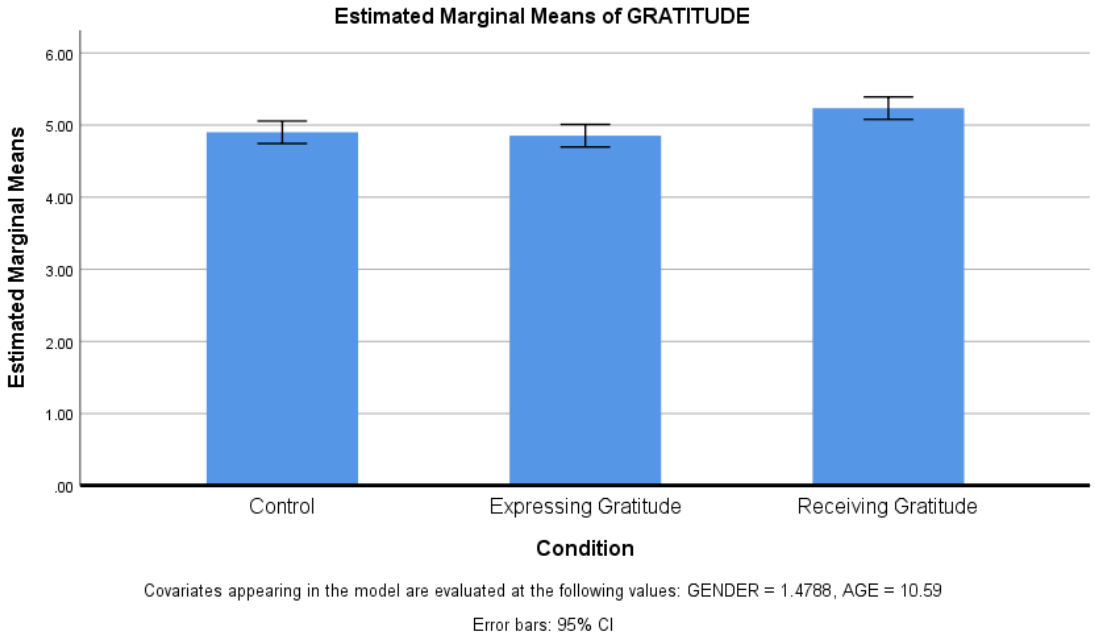

Figure 7: Effect of receiving, expressing gratitude and control on gratitude (Study 3)

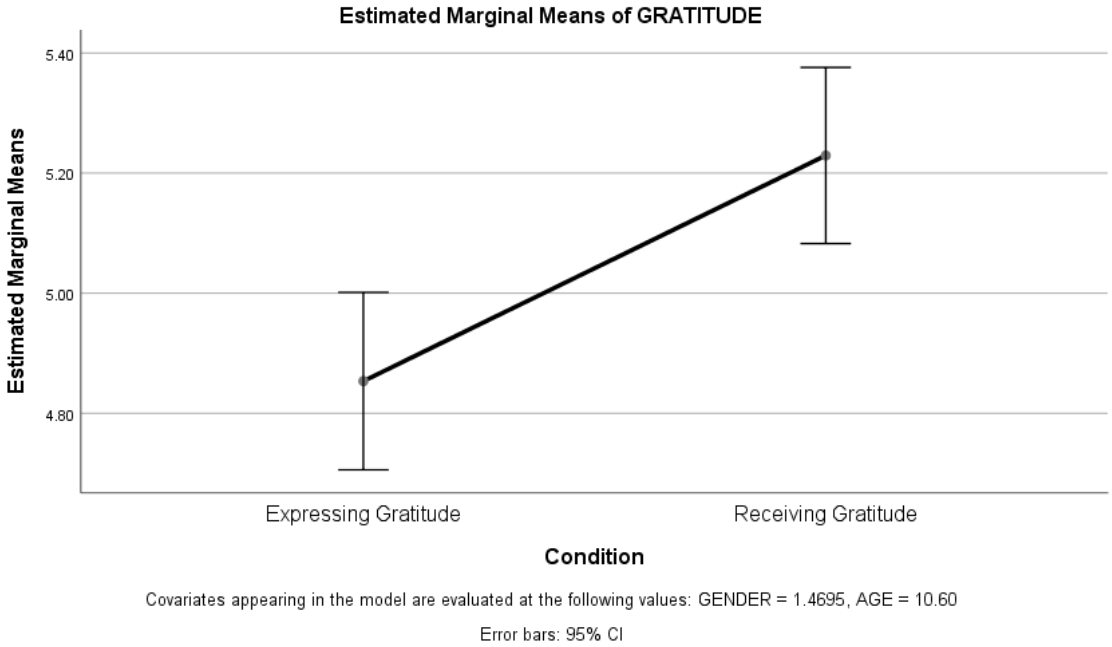

Figure 8: Effect of receiving & expressing gratitude on gratitude (Study 3)

Dependent Variable	Control	Expressing Gratitude	Receiving Gratitude	F
Gratitude (GQ-5)	4.90 (.079)A	4.864 (.080)B	5.219 (.079)AB	6.806 (2,561) p=.001

Note: The values under the conditions represent estimated means. The number in the parentheses next to the means represents the standard error. The values adjacent to the F's represent the degree of freedom. Means that share a CAPITILIZED letter are significantly different (p<.05) while means that share a non-capitalized letter are moderately significant (p<.1).

Table 3: Comparison of receiving, expressing gratitude and control by measure of gratitude (Study 3)

Prosocial behavior: We then tested the effect of condition on prosocial behavior, which revealed a significant main effect (*F(2,550) = 8.688, MSE =7.893, p < .001, η2 = .031*). Follow-up test between conditions revealed existence of a significant difference between the receiving gratitude and expressing gratitude condition ($M_{expressing}$ *= 3.18 vs.* $M_{receiving}$ *= 2.94, F (1, 364) = 7.528, p = .006, η2 = .020*), indicating receiving gratitude as a stronger motivator for prosocial behavior. Further, participants in the receiving gratitude condition behaved more prosocially compared to students in the control condition ($M_{receiving}$ *= 3.18 vs.* $M_{control}$ *= 2.80, F (1, 373) = 18.625, p < .001, η2 = .048*). There was no statistical difference between the expressing gratitude and control groups (*p = .20*).

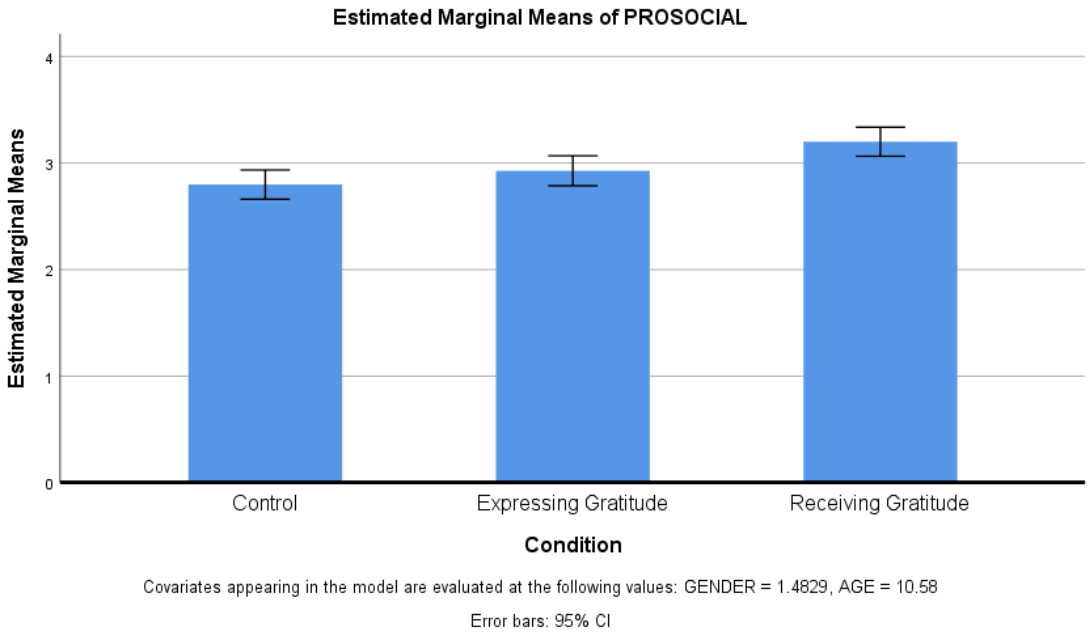

Figure 9: Effect of receiving, expressing gratitude and control on prosocial behavior (Study 3)

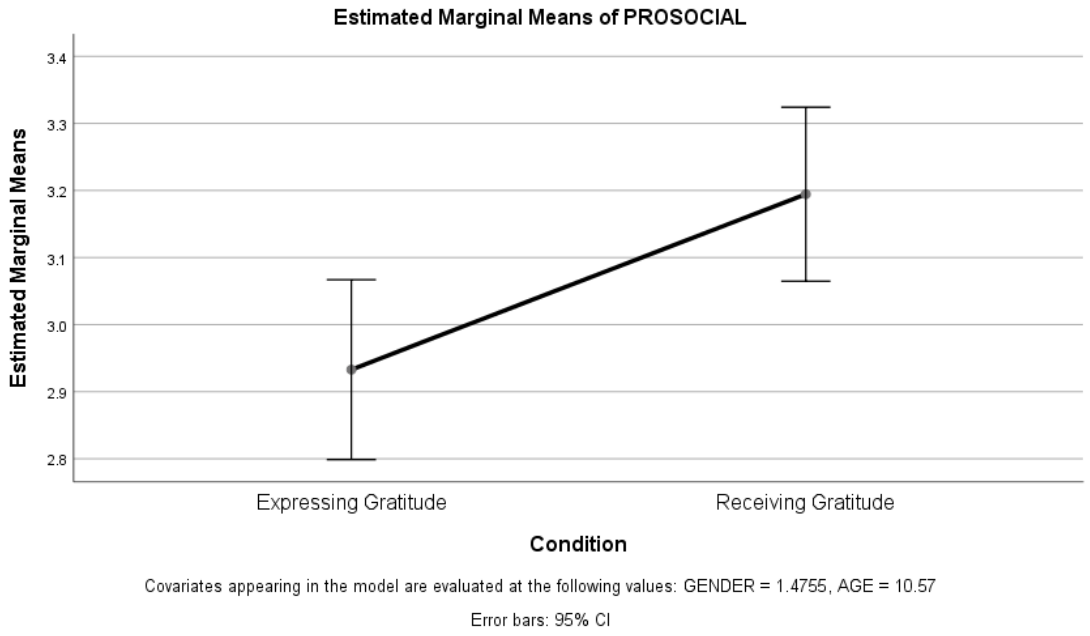

Figure 10: Effect of receiving and expressing gratitude on prosocial behavior (Study 3)

Dependent Variable	Control	Expressing Gratitude	Receiving Gratitude	F
Prosocial behavior	2.797 (.070)A	2.927 (.072)B	3.199 (.069)AB	8.688 (2,550) p<.000

Note: The values under the conditions represent estimated means. The number in the parentheses next to the means represents the standard error. The values adjacent to the F's represent the degree of freedom. Means that share a CAPITILIZED letter are significantly different (p<.05) while means that share a non-capitalized letter are moderately significant (p<.1).

Table 4: Comparison of receiving, expressing gratitude and control by measure of prosocial behavior (Study 3)

A crossbar analysis revealed that participants in the receiving gratitude group were more likely to give away four pens, despite keeping only three for themselves. They were also less likely to allocate just one pen to their friends, compared to the children in expressing gratitude and control condition.

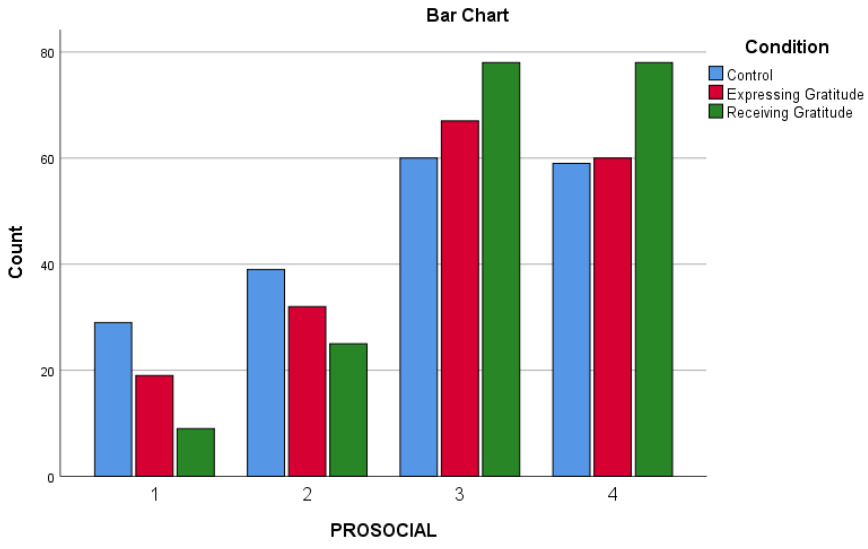

Figure 11: Cross tabulation of Prosocial behavior across expressing, receiving gratitude and control (Study 3)

		Control	Expressing Gratitude	Receiving Gratitude	Total
Prosocial	1	29	19	9	57
	2	39	32	25	96
	3	60	67	78	205
	4	59	60	78	197
Total		187	178	190	555

Table 5: Cross tabulation of Prosocial behavior across expressing, receiving gratitude and control (Study 3)

Grit: Similarly, we also found a significant main effect for grit (*F(2,534) = 4.379, p = .013, η2 = .016*). Unpacking the results showed higher grit in students in the receiving gratitude condition compared to those in the expressing gratitude condition ($M_{receiving}$ *= 3.11 vs.* $M_{expressing}$ *= 2.98, F (1, 356) = 7.071, p = .008, η2 = .019*). Children in the receiving gratitude condition also exhibited more grit compared to children in the control ($M_{receiving}$ *= 3.11 vs.* $M_{control}$ *= 2.99, F (1, 360) = 5.901, p = .016, η2 = .016*). There was no significant difference between children in the expressing gratitude and control condition (*p = .747*).

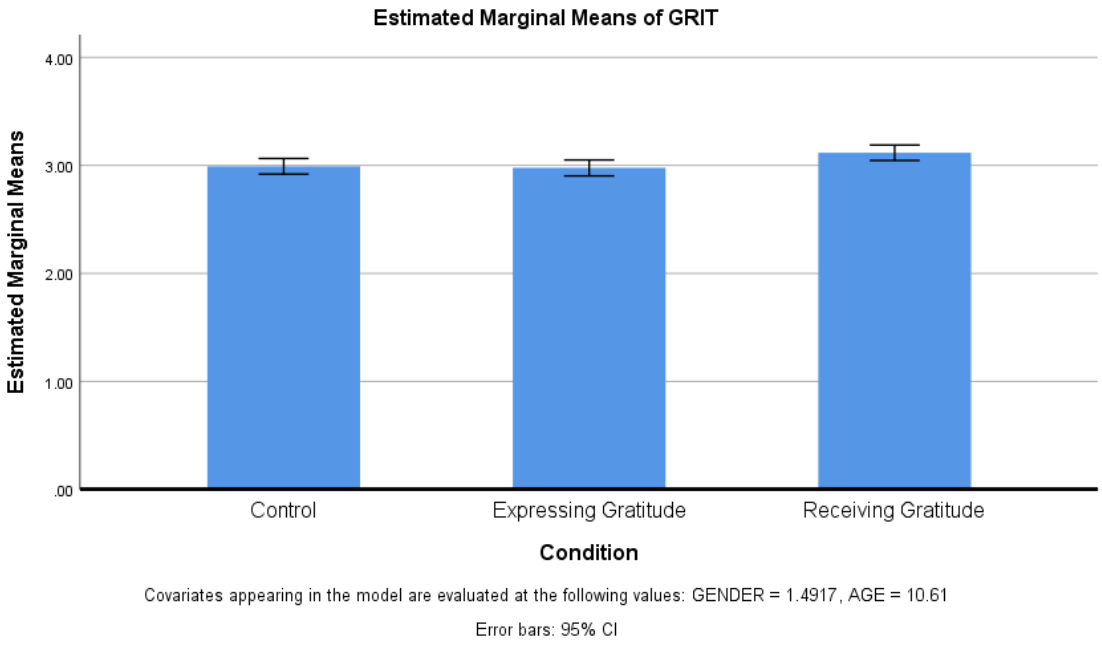

Figure 12: Effect of receiving, expressing gratitude and control on grit (Study 3)

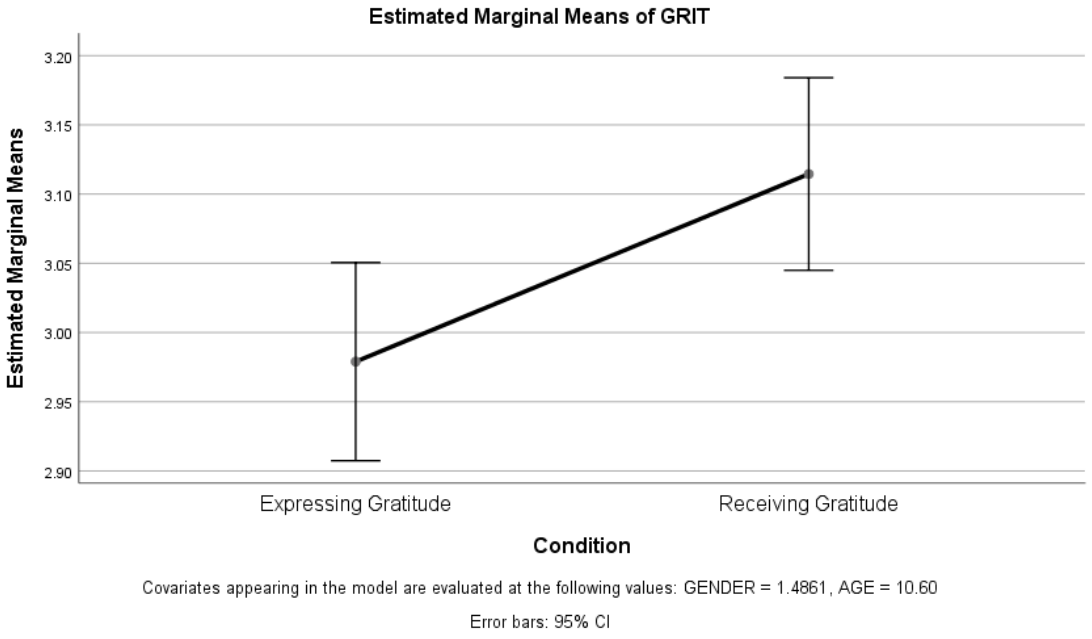

Figure 13: Effect of receiving and expressing gratitude on grit (Study 3)

Dependent Variable	Control	Expressing Gratitude	Receiving Gratitude	F
Grit	2.992 (.037)A	2.976 (.037)B	3.117 (.036)AB	4.379 (2,534) p=.013

Note: The values under the conditions represent estimated means. The number in the parentheses next to the means represents the standard error. The values adjacent to the F's represent the degree of freedom. Means that share a CAPITILIZED letter are significantly different (p<.05) while means that share a non-capitalized letter are moderately significant (p<.1).

Table 6: Comparison of receiving, expressing gratitude and control by measure of Grit (Study 3)

Self Esteem: Self-esteem as measured through the ten-item scale (Winch & Rosenberg, 1965) exhibited a significant main effect (*F(2,557) = 4.779, MSE = 1.088, p = .009, η2 = .017*). Follow-up test between conditions revealed existence of significant difference between the receiving gratitude compared to the expressing gratitude condition ($M_{receiving}$ *= 2.93 vs.* $M_{expressing}$ *= 2.79, F (1, 368) = 7.958, MSE = 1.796, p = .005, η2 = .021*), revealing children in the receiving gratitude to have more self-esteem than those expressing gratitude. Similarly, greater self-esteem was observed for the children in the receiving gratitude as compared to those in the control ($M_{receiving}$ *= 2.93 vs.* $M_{control}$ *= 2.83, F (1, 377) = 4.377, MSE = .993, p = .037, η2 = .011*). A statistically significant difference in self-esteem did not exist when comparing for expressing gratitude and control (*p = .302*).

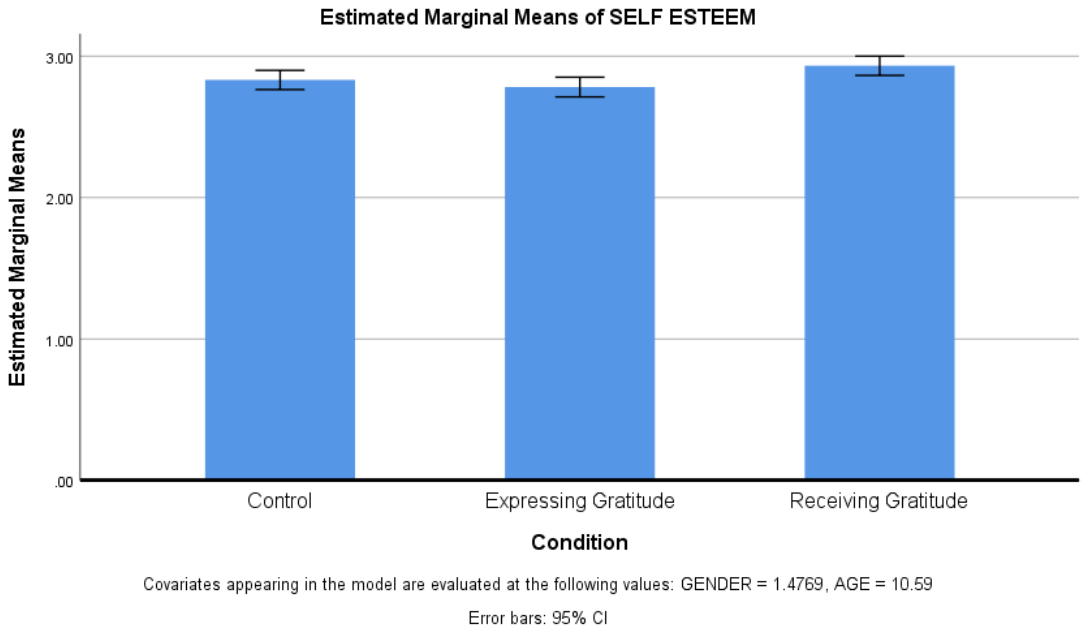

Figure 14: Effect of receiving, expressing gratitude and control on self-esteem (Study 3)

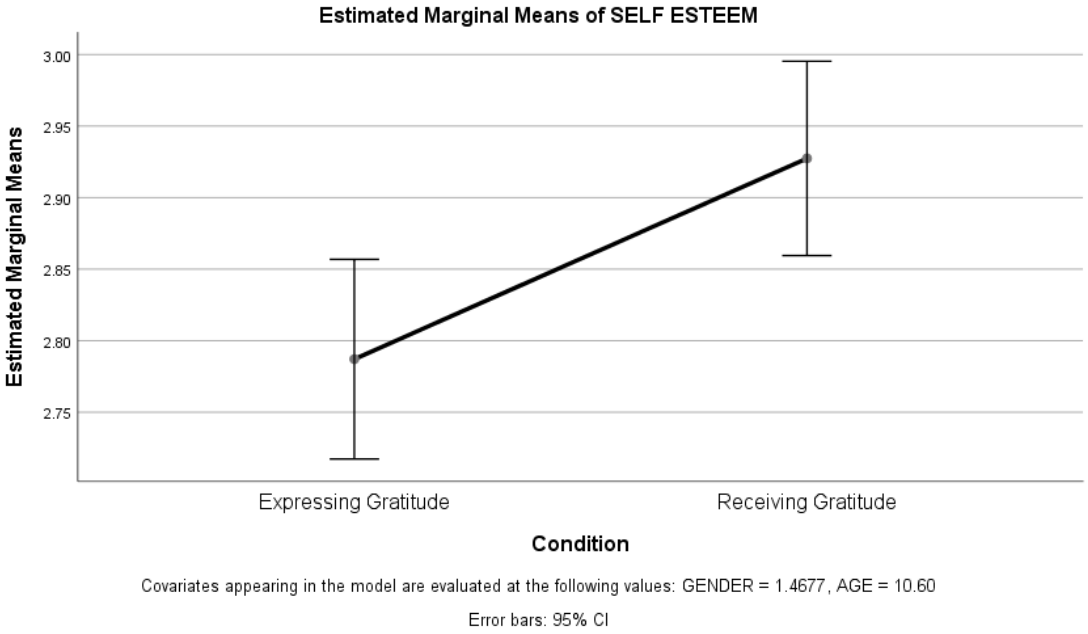

Figure 15: Effect of receiving and expressing gratitude on self-esteem (Study 3)

Dependent Variable	Control	Expressing Gratitude	Receiving Gratitude	F
Self Esteem	2.831 (.035)A	2.781 (.036)B	2.932 (.035)AB	4.779 (2,557) p=.009

Note: The values under the conditions represent estimated means. The number in the parentheses next to the means represents the standard error. The values adjacent to the F's represent the degree of freedom. Means that share a CAPITILIZED letter are significantly different (p<.05) while means that share a non-capitalized letter are moderately significant (p<.1).

Table 7: Comparison of receiving, expressing gratitude and control by measure of Self Esteem (Study 3)

Mediational Analysis: To examine whether grit or self-esteem mediated the effect of gratitude type on prosocial behavior, we employed the a mediation analysis (PROCESS macro, Model 4, Andrew 2022; 5,000 bootstrap sample) and following the instructions by Baron & Kenny (1986). Grit met all the criteria that include: the intervention significantly affected prosocial behavior ((*β =.1925), t(355)=3.8967, p<.001*); the intervention also significantly affected the mediator i.e. grit: ((*β = .0629), t(355)= 2.4635, p=.0142*); grit significantly predicted prosocial behavior while controlling for the treatment: ((*β =.2431), t(355)=2.3706, p<.0183*); after controlling for grit, the effect of the intervention on prosocial behavior decreased (from *β =.1925* to *β =.1772*) and the size of the indirect effect was .0153 and the 95% bias-corrected confidence interval based on 5000 random samples excluded zero, 95% CI [*.0006, .0351*].

The above shows that grit mediated the effect of the treatment on prosocial behavior. However, self-esteem did not meet the criteria.

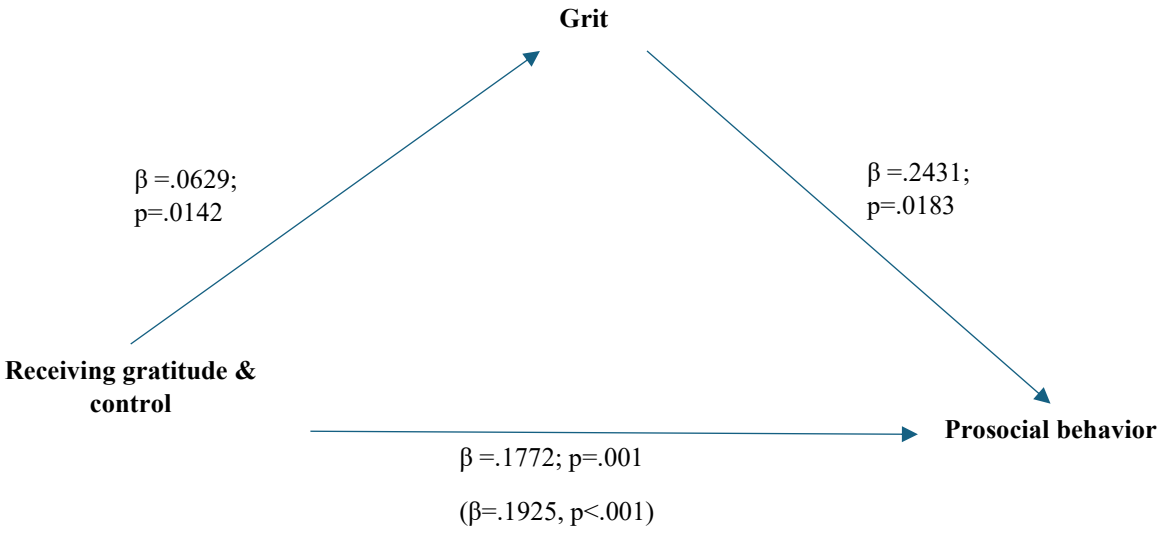

Figure 16: Mediational Analysis of receiving gratitude and prosocial behavior through grit

Discussion

Study 3 extends the findings of Study 1 and Study 2 by examining how *receiving gratitude* versus *expressing gratitude* impacts gratitude and prosocial behavior in children. The results confirmed our predictions, with children in the *receiving gratitude* condition displaying significantly higher levels of gratitude and engaging in more prosocial behavior than those in the *expressing gratitude* condition. Additionally, the results also provide evidence that *expressing gratitude* increased prosocial behavior through persistence belief rather than increase in self-belief. Specifically, the increased prosocial behavior is through a higher amount of grit rather than through the elevated

levels of self-esteem. Our results show that when children are thanked for their deeds (in the *receiving gratitude* condition), they exhibit greater prosocial behavior and display more grit compared to those *expressing gratitude* or in the control group. This suggests that acknowledging children's good deeds may have a greater influence on their prosociality than prompting them towards *expressing gratitude*.

GENERAL DISCUSSION

The findings from this series of studies (Study 1-3) provide significant insights into how receiving gratitude versus expressing gratitude influences prosocial behavior in students. Contrary to much of the previous research, which has primarily focused on the benefits of expressing gratitude (McCullough et al., 2001; Froh et al., 2008), our results show that *receiving gratitude* has a more powerful and sustained effect on prosocial behavior. This effect was consistent across different contexts, whether the gratitude came from teachers, or peers. Our study thus makes several important contributions to the understanding of prosocial in childhood development.

First, this study looks at the impact of receiving gratitude, a relatively unexplored area in research. We obtain evidence of the beneficial impact of receiving gratitude versus expressing gratitude. In Study 1, designed as a teacher -children exchange of gratitude expression, we find children receiving gratitude to exhibit greater prosocial intent. To check whether this result is consistent in a peer-peer exchange of expressions of gratitude, Study 2 was designed to have children exchange gratitude

notes with each other. The results from this field study also show that children are more prosocial across two behavioral tasks. Study 3, a longitudinal ten-day exercise with repetitive exchange of gratitude, also show similar results. While many studies have highlighted the positive outcomes associated with expressing gratitude, including increased life satisfaction and prosocial behavior (McCullough et al., 2001; Froh et al., 2008), our findings shift the emphasis to the impact of being the recipient of gratitude. We demonstrate that acknowledging children's contributions in form of receiving gratitude is a stronger motivator for prosocial behavior than the act of expressing gratitude. This is a key finding that challenges the traditional focus on expressing gratitude as the primary driver of prosocial behavior (Algoe et al., 2008; Bartlett & DeSteno, 2006).

Another important contribution is the identification of grit as a mediator for prosocial behavior when children receive gratitude. Grit is typically studied in the context of academic achievement. However, our study shows that receiving gratitude promotes grit in students, which in turn sustains their prosocial behavior over time. This extends the scope of grit beyond academic success, suggesting that it also plays a critical role in social perseverance, helping children maintain prosocial actions even when the immediate incentives are not obvious. This connection between gratitude and grit is a novel insight and provides a practical avenue for educators to foster not only academic resilience but also social resilience in children (Duckworth & Quinn, 2009; Sigmundsson & Hauge, 2023).

Interestingly, while self-esteem was positively influenced by receiving gratitude, it did not serve as a mediator for repeated prosocial behavior. This finding suggest that while self-esteem may boosts prosocial actions (Bernstein & Simmons, 1974), it may not directly translate to an increase in sustaining prosocial tendencies in children. This finding suggests that persistence belief rather than self-belief, is the more critical factor in sustaining prosocial behavior in children when they receive gratitude. While we did not test the possibility of serial mediation of receiving gratitude, leading to an increase in self-esteem, which in turn increases grit and prosocial behavior, this is an alternative mechanism that requires further thought and analysis.

Our study also finds consistent evidence for the increased levels of gratitude in receiving gratitude versus expressing gratitude. Typically, expressing gratitude has been associated with feeling grateful. Our findings demonstrate another way of inculcating gratitude, which is receiving gratitude. The results provide empirical evidence supporting that people also experience gratitude when they have the opportunity to help others (Fehr et al., 2016; Grant et al., 2008). Most of the earlier research on gratitude consider it as a sense of appreciation and indebtedness for benefits or help received from others (Bartlett & DeSteno, 2006; DeSteno et al., 2010; Emmons & McCullough, 2004; McCullough et al., 2001; Tsang, 2006). We believe that there is another kind of gratitude which was experienced in the received gratitude group. The gratitude experienced in the children in the receiving gratitude group is more likely to have been from the state of being. Research on experiential consumption versus material

consumption also assets that people may feel untargeted gratitude which can be different to the traditional definition of gratitude towards act of benevolence (Walker et al., 2016). Traditional gratitude is typically fuelled by norms of reciprocity, of being morally obligated to return the favor from whom the benefit was received. However, we believe the gratitude in our participants was more to do with their state of feeling grateful – when one feels grateful of being, for all the good around, and their ability to act as a beneficiary. This according to us drove the generosity we observed in our participants.

These findings have significant policy implications for educational systems, parenting strategies, and broader societal interventions aimed at fostering gratitude and prosocial behavior in students. First, educational policies should incorporate gratitude-based interventions that prioritize acknowledging children's efforts through activities that enable children to receive gratitude. Schools could introduce routine gratitude sessions in classrooms, where children can be a receipt of gratitude for small but meaningful contributions. These sessions could be integrated into social-emotional learning (SEL) programs that are already widely implemented in many schools. Research has shown that such programs can improve children's emotional regulation and social skills (Padilla-Walker & Christensen, 2011), and our study suggests that receiving gratitude could be a powerful addition to these interventions. In addition, school policies on student recognition should be enhanced to create more opportunities

for students to receive gratitude for their prosocial actions. Schools could implement peer recognition programs where students thank each other for helping behaviors, fostering a culture of mutual appreciation that reinforces prosocial actions. By institutionalizing these programs, schools can create environments that naturally promote social cooperation and emotional well-being among students (Wentzel, 1993; Laible et al., 2004).

Second, parenting guidelines should encourage caregivers to recognize and appreciate their children's efforts regularly. Rather than focusing solely on teaching students to express thanks, parents should be urged to acknowledge and praise the helpful behavior of their children. This positive reinforcement can cultivate both self-esteem and grit, ultimately promoting long-term prosocial behavior.

At the broader societal level, public policies should encourage the development of community-based programs that emphasize the importance of recognizing and thanking children for their contributions to the community. These programs can provide platforms for children to engage in civic activities while receiving public recognition for their efforts, which could not only sustain their engagement in prosocial behaviors over time (Carlo & Padilla-Walker, 2020; Fuligni, 2018), but also increase grit, helping them persevere in prosocial activities.

While the current study provides valuable insights, there are several limitations. First, the study was conducted in a specific cultural context (Indian schools), and future research should explore whether these findings generalize to other cultural settings.

Additionally, the long-term effects of receiving gratitude on prosocial behavior and grit remain unknown, and future studies could use longitudinal designs to assess whether the benefits of receiving gratitude persist for longer periods and perhaps into adulthood. Finally, future research should investigate other potential mediators between gratitude and prosocial behavior, such as empathy or social connectedness, to refine the development of gratitude-based interventions.

In conclusion, this study provides compelling evidence that receiving gratitude plays a significant role in fostering gratitude and prosocial behavior in children. The positive reinforcement that comes from being thanked enhances children's grit, which sustains their prosocial actions over time. These findings challenge the traditional emphasis on expressing gratitude and suggest that interventions focusing on receiving gratitude could be more effective in promoting long-term social cooperation among children. The policy implications of these findings are wide-ranging, from school curricula to parenting practices, and offer practical ways to foster more compassionate, cooperative, and socially responsible young individuals.

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CHAPTER III:

ESSAY 2: *THE ROLE OF SUBGOAL-ORIENTED NUDGES IN IMPROVING ACADEMIC PERFORMANCE*

ABSTRACT

Long-term goals, such as fitness, retirement security, and skill mastery require sustained effort and self-regulation. While traditional reinforcement, such as rewards and penalties, improve desired outcomes, they often come with unintended psychological consequences. Similarly, maintaining academic goals require sustained effort and self-regulations and many students struggle with maintaining discipline over time. This study explores the impact of subgoal-oriented nudges as a non-coercive intervention to enhance academic performance. Using a field experiment conducted over several months with high school students preparing for a competitive examination, we examine the effectiveness of nudging students towards subgoal completion (i.e., assignment completion and submission) in improving test performance. Our findings suggest that subgoal-oriented nudges enhance academic outcomes, particularly for children with lower self-discipline and learning-goal motivation. Additionally, we identify a gender-based divergence – while nudges positively benefit the male students, they negatively impact the female students. The study also examines the persistence of nudge effects, revealing that performance improvement remains even after the intervention is removed. These results have broad implications for educational policy and behavioral interventions, demonstrating the potential of nudging towards sub-goals in shaping students' performance in high-stake environments.

Keywords: behavioral nudges, subgoal, self-regulation, academic performance, motivation, gender differences, habit formation, field experiment

INTRODUCTION

Breaking long-term goals into granular subgoals provides clear markers to track progress, making them more manageable. For example, improving health may involve biweekly workouts, saving for retirement may require monthly allocations, and mastering a musical instrument can follow structured levels, such as Trinity levels one through eight. Subgoal framing transforms an overwhelming and distant objective into smaller, achievable milestones, making it easier to maintain discipline. However, research indicates that self-discipline is a stable personality trait that diminishes under continuous strain, much like a fatigued muscle (Baumeister et al., 1998). Even individuals with high levels of self-control may struggle to sustain self-discipline over time, particularly, when repeatedly faced with tasks that require self-regulation.

While rewards and punishments can reinforce behavior, they may also create resentment or undermine intrinsic motivation in the long term (Deci et al., 1999). Recent research has explored non-intrusive, non-coercive interventions, particularly nudges, which are interventions that guide behavior without restricting choices or imposing penalties (Thaler & Sunstein, 2008; Schmidt, 2024). In this study, we explore the use of non-intrusive, non-coercive interventions, specifically subgoal-oriented nudges, in sustaining motivation and supporting the pursuit of long-term goals. Through a field experiment involving students preparing for a competitive examination, we investigate how nudging toward subgoals can enhance academic outcome.

Nudging toward subgoals may be beneficial for several reasons. First, nudges have been shown to effectively influence behavior across diverse domains (Benartzi et al., 2017; DellaVigna, 2009; Diamond & Vartiainen, 2012; Hough, 2013; Sunstein, 1999; Thaler, 2005; Thaler & Sunstein, 2008; Lavecchia et al., 2016). In educational settings, nudge-based interventions, such as framing, feedback, reminders and grouping have demonstrated positive impact on academic outcomes and motivation (Damgaard & Nielsen, 2018; Pugatch & Wilson, 2018; Kraft & Rogers, 2015; Fryer, 2016; Bergman & Rogers, 2017; Carrell et al., 2011; Levitt et al., 2016; Wagner, 2017; Apostolova-Mihaylova et al., 2015; McEvoy, 2016; Burger et al., 2011; De Paola & Scoppa, 2011; Tuckman, 1998; Ariely & Wertenbroch, 2002). Second, nudges are particularly valuable for students, who often lack the cognitive strategies necessary for effective self-regulation due to their emphasis on the present. Teenagers, in particular, are more susceptible to overemphasis on the present due to increased activity in the midbrain limbic system (Lavecchia et al., 2016), accounting for their preference for immediate rewards and pleasure (Chapman et al., 2012). Finally, the non-intrusive and non-coercive nature of nudges makes them an appealing alternative to traditional disciplinary methods, offering external reinforcement without imposing penalties or incentives, which come with their negative psychological effects (Deci et al., 1999). In highly competitive academic settings, where disciplined routines are critical yet vulnerable to pressure, subgoal-oriented nudges can offer valuable scaffolding to students to stay on track without relying solely on their self-regulation.

Using a field experimental design, we establish the causal relationship between subgoal-oriented nudges and academic performance, offering a non-coercive alternative for educational environment design. Specifically, we investigate how self-regulation abilities (self-discipline), motivation (learning goals), and gender impact academic outcomes under a subgoal-oriented nudge. Additionally, we examine the persistence effect of nudges on academic performance, after the nudges have ceased. Our research makes the following key contributions. First, it contributes to an emerging body of research exploring how choice infrastructure can shape important outcomes. Whereas previous studies have documented nudges, such as imposing deadlines (Ariely & Wertenbroch, 2002), frequency of examinations (De Paola & Scoppa, 2011; Tuckman, 1998) and feedback (Azmat & Iriberri, 2010), our study examines subgoal-oriented nudges as a means to improve academic outcomes in students. Second, this study examines the persistence of nudge effect after it is removed, contributing to the discourse on long-term impacts of choice-infrastructure (Allcott & Rogers, 2014). Third, the findings add to the self-regulation and motivation literature by documenting how nudges help students having lower psychological traits on academic performance. Finally, the gender difference observed adds to the gender literature and finds evidence of divergent impact of nudges on gender.

Our work has important practical implications. By demonstrating how nudges can improve educational outcomes, we highlight the potential for scholars in domains of behavioral sciences and marketing to consider education as areas of scholarship and

(Grewal et al., 2022). Crucially, our research offers insights into improving outcomes for children with lower self-regulatory abilities and motivation through the non-coercive intervention of nudges. Nudge-based interventions have significant policy implications, extending beyond education to inform diverse policy domains. Similar interventions hold promises for diverse domains, including public health, workplace productivity, environmental sustainability, and financial planning. For example, subgoal-oriented nudge interventions could promote medication adherence, increase physical activity, enhance workplace engagement, encourage sustainable behaviors like energy conservation, and help with long term retirement planning.

The rest of the essay is organized as follows: The next section discusses the relevant literature and constructs, followed by the study design and data. We then analyze the impact of subgoal-oriented nudges on educational outcomes, examining its impact on self-regulation, motivation, and gender. Finally, we assess the persistence of nudge effects and conclude with policy recommendations.

CONCEPTUAL DEVELOPMENT

Nudges and Academic Performance

Nudges have proven effective in education settings, encouraging behaviors and outcomes, such as improved grades, test scores, attendance, and study habits (Pugatch & Wilson, 2018; Kraft & Rogers, 2015). Unlike disciplinary approaches that rely on direct rewards or punishments, nudges subtly steer individuals toward desirable actions

through appropriate framing, reminders, information, feedback, or the structuring of choices. For example, Pugatch & Wilson (2018) demonstrated that brief text message reminders to university students about upcoming tutoring sessions led to significantly higher attendance rates. Similarly, Kraft & Rogers (2015) found that weekly updates to parents on missed assignments and deadlines improved high school students' homework completion and academic performance. Castleman & Page (2015) used personalized text reminders to guide students navigate the college enrolment process, reducing drop-out rates by helping them meet critical deadlines. Doss et al. (2019) found that providing parents with simplified, actionable tips via text messages improved literacy outcomes in early childhood education. These examples highlight the versatility of nudges in influencing behavior without imposing significant costs or requiring substantial effort from participants.

Beyond education, nudges have also been applied to influence students' behaviors in domains such as health, wellbeing, and deliquescent behavior. For example, by positioning fruits and vegetables at eye level in cafeterias increased healthy consumption (Hollands et al., 2013), rewarding students for consistent participation in extracurricular activities through gamification helped in improving mental and physical health (Gkintoni et al., 2024), and informing students regarding decreased harassment in school lead to reduction of bullying behavior (Paluck & Shepherd, 2012).

Nudges have also been extensively applied in driving adult behavior, demonstrating their versatility across diverse fields (Beshears & Kosowsky, 2020).

Sending reminders via text messages have increased adherence to medication regimens in patients with chronic conditions (Thaler & Sunstein, 2008). Default enrolment has shown to be successful for various programs (Bergman & Rogers, 2017), including organ donation (Johnson & Goldstein, 2003) and retirement saving (Madrian & Shea, 2001). Normative information, highlighting attainable social comparisons (Rogers & Feller, 2016) drives positive behavior (Cialdini & Goldstein, 2004). People reduce energy use when they learn they consume more than their neighbours (Allcott & Rogers, 2014; Schultz et al., 2007), become more likely to vote when they hear that most people vote (Gerber & Rogers, 2009), and reuse resources when they learn other people do the same (Goldstein et al., 2008). Similarly, tax filing rates increase when taxpayers learn most peers have already filed (Hallsworth et al., 2017), thus increasing tax compliance.

These findings underscore the broad applicability of nudges in driving positive outcomes in various fields, including enhancing academic performance through non-coercive means.

Role of Individual Differences: Self-Regulatory Abilities and Learning Goals

Individual traits, such as self-regulation and motivation, significantly influence adherence and outcomes, particularly in academic settings. Self-regulation, comprising of impulse control and ability to delay gratification has shown to be a key determinate of success in academic settings (Duckworth & Seligman, 2005). Research consistently

shows that self-disciplined students outperform their peers, as they exhibit a greater ability to persist through academic challenges and distractions. Duckworth & Seligman (2005) found that self-discipline outperformed intelligence quotient (IQ) as a predictor for academic success. In their longitudinal study of 140 eighth graders, replicated with 164 students, self-discipline predicted attendance, test scores, final grades, and selection into a competitive high school, whereas IQ did not. Wolfe & Johnson (1995) found that self-discipline was the strongest predictor of college GPA, surpassing SAT score and also other 32 measured personality variables like self-esteem, extraversion and energy level. In another study on Phi Beta Kappa undergraduates, high self-discipline distinguished them from others, even though the groups were comparable in terms of intellectual abilities (Hogan & Weiss, 1974). By using a large sample of undergraduate students, Tangney et al. (2004) demonstrated strong correlation between self-discipline and grades and other personal and interpersonal strengths. Motivating students to work harder in school is, thus, a worthwhile pursuit (McEvoy, 2016). However, like other personality traits, self-discipline tends to be relatively stable over time and difficult to change. Marshmallow Experiment (Mischel et al., 1972), which tested students' ability to delay gratification, demonstrated that self-control and self-discipline are deeply ingrained. Evidence also shows that their ability to delay gratification remains consistent into adulthood, suggesting that self-discipline is a stable trait (Mischel et al., 1989). Self-discipline, over a period of time, has also been linked to willpower depletion. Baumeister et al. (1998) introduced the concept of ego depletion, which

suggests that self-discipline operates like a muscle -when overused, it becomes fatigued. This implies that even individuals with high levels of self-control may struggle to maintain self-discipline over time, particularly when repeatedly faced with tasks that require self-regulation.

Intrinsic motivation in children is linked to goal setting, where self-defining objectives influence motivation. Students with learning goals, focus on skill and knowledge acquisition, while students with performance goals, work to demonstrate competence (Ames & Archer, 1988). In intellectual achievement, learning goals has shown to promote a mastery-oriented mindset (Elliott & Dweck, 1988; Dweck, 1986; Dweck & Leggett, 1988), leading to consistently better academic performance. Learning goal-oriented students view challenges as opportunities for mastery through effort, employing self-instruction and self-monitoring. Unlike performance goal-oriented peers, they remain optimistic about the effectiveness of their efforts. While learning goals motivate intrinsic motivation for mastery, developing and sustaining them can be difficult especially under external pressures or resource limitations.

While self-regulation and motivation are critical to academic success, research highlights the challenges of sustaining these traits (Tangney et al., 2004), particularly, under external pressures or limited resources (Duckworth & Seligman, 2005). Apart from instilling a growth mindset in students (Blackwell et al., 2007), improving and sustaining these traits have met with limited success. The question then arises*: Can non-intrusive and external strategies address the constraints of self-regulation and*

lower learning-goal motivation? Nudges represent a unique behavioral mechanism that operates distinctively from constructs of internal motivation, relying on external cues to create an environment conducive to focused behavior rather than use of individual's internal ability. When designed appropriately, nudges can also provide a structured framework that ensures consistency without relying on intrinsic motivation which could be useful in driving desired behavior despite lower regulation and lower motivation.

Theories of Gender Differences

Men and women respond differently to external factors and internal motivation. Self-Determination Theory (Deci & Ryan, 1985) suggests external factors such as rewards can undermine intrinsic motivation by reducing autonomy (Deci & Ryan, 1985). Female students are more likely to be adversely affected by the autonomy-undermining aspects of external control (in our case the external nudges), as they tend to prioritize intrinsic motivation in educational contexts (Vallerand & Blssonnette, 1992). In externally controlled tasks, they may perceive a loss of ownership, reducing their intrinsic drive and engagement. Deci et al. (1999) provided empirical support through a meta-analysis, showing that external rewards and controls often reduce intrinsic motivation, particularly in environments that value autonomy. Higher internalization of academic goals by female students could make them particularly susceptible to this effect.

Attribution Theory (Weiner, 1985) examines how individuals attribute their successes or failures to internal or external factors. Female students are often socialized to attribute success to external factors, such as luck or effort, and failure to internal deficits, such as lack of ability (Dweck, 1986). Nudges may aggravate the perception that success is contingent on external oversight rather than internal ability. They may internalize failure under an external nudge as evidence of their incompetence, leading to reduced self-efficacy and increase in the likelihood of developing a "helpless" attribution style. Dweck (1986) also finds that female students are more vulnerable in highly evaluative environments, especially where failure is seen as a sign of innate incompetence.

According to Expectancy-Value Theory (Wigfield & Eccles, 2000; Eccles & Wigfield, 2002) individuals' expectations of success and the value they assign to a task determines their motivation towards the task. Female students often assign greater value to tasks aligned with intrinsic goals, such as personal growth or community contribution (Eccles & Wigfield, 2002; Wigfield et al., 1997). Externally motivated actions, such as nudging toward goal completion, can reduce task value, lowering engagement and performance. Eccles & Wigfield (2002) found that female students prioritize communal and intrinsically rewarding goals over external pressures, making nudges potentially counterproductive.

Persistence of Nudge Effects Post-Intervention

An emerging area of nudge research investigates whether behavioral changes persist after the removal of an intervention (Allcott & Rogers, 2014). Habit are automatic human behavior, which are a result of frequent past behaviors (Ouellette & Wood, 1998) and are patterns that are again repeated in future behavior (Triandis, 1979). Thus, when behaviors are repeated, they can become automatic, reducing reliance on external stimuli (Lally et al., 2010) even when the reinforcement is removed. This has been seen in educational interventions, where encouragement for routine behaviors often result in lasting impacts since students internalize these habits (Kraft & Rogers, 2015). For instance, Burger et al. (2011) found that interventions like regular deadlines and structured feedback helped students maintain academic routines even after the interventions ceased. Similarly, Wagner (2017) reported that students who developed consistent study habits under monitored conditions could sustain these behaviors when left unmonitored (De Paola & Scoppa, 2011).

Predictions

We test the effect of a subgoal-oriented nudge for completion of assignments on academic performance. Past theory and research suggest that nudges can promote compliance behavior. For example, providing reminders can ensure consistent behavior through external support (Damgaard & Nielsen, 2018). Therefore, we hypothesize:

Hypothesis 1: *Subgoal-oriented nudge (to complete assignments) will increase academic performance.*

Since self-discipline is difficult to maintain over a period of time and children with lower self-discipline require external factors to succeed, we propose that:

Hypothesis 2: *Students with lower self-regulatory abilities (self-discipline) will benefit more from the subgoal-oriented nudge to complete assignments.*

Similarly, learning goal-oriented students view challenges as opportunities to mastery through their self-effort. Learning-goal oriented students are self-driven and are able to self-monitor (Dweck & Leggett, 1988). However, students with lower learning goals need external support mechanisms. Therefore, we propose:

Hypothesis 3: *Students with lower motivation (lower learning goals) will benefit more from the subgoal-oriented nudge to complete assignments.*

Self-Determination Theory, Attribution Theory, and Expectancy-Value Theory provide a theoretical framework for understanding the distinct ways female and male students react to external and internal motivation cues. Collectively, prior theorizing of research supports that external control (in our case, subgoal-oriented nudge) may undermine female students' sense of autonomy, competence, and intrinsic motivation, inadvertently undermining their success. As a result, we propose:

Hypothesis 4a: *Subgoal-oriented nudge will have a positive impact on male students' academic performance.*

Hypothesis 4b: *Subgoal-oriented nudge will have a negative impact on female students' academic performance.*

Habits established in supportive environments may persist even when external scaffolding is removed, especially in case of high stakes. Therefore, we propose:

Hypothesis 5: *The positive effects of subgoal-oriented nudges persist even after their removal, sustaining improved performance.*

BACKGROUND AND FIELD EXPERIMENT

The Indian Institutes of Technology-Joint Entrance Examination (IIT-JEE) designed to select candidates for admission into undergraduate engineering programs at the Indian Institutes of Technology (IIT), is one of the most competitive exams in the world. In 2023, approximately 1.5 million students registered for the JEE Main exam, and only about 16,000 qualified for the available seats at the 23 IITs across the country, resulting in an acceptance rate of about 1%. This makes the IIT-JEE one of the most difficult exams to quality globally.

Given its difficulty and implication of success, coaching has become essential for IIT-JEE preparation, providing structured curricula, expert faculty, rigorous testing, and resources to enhance subject mastery. Our intervention was conducted at two

centers where students prepare for competitive exams like the IIT-JEE. This setting is unique for its intense focus and dedication, creating a culture of hard work, long study hours, and high commitment to success. Students follow strict routines and undergo frequent evaluations through regular tests and assessments.

STUDY

Participants. Participants in the study were drawn from two equivalent centers of a coaching institute, with each center corresponding to one of the two groups. One center was assigned as the treatment group, where students were exposed to the subgoal-oriented nudge intervention, while the other served as the control group, continuing with their regular study practices without any additional intervention. Ethical approval was obtained from the Institutional Review Board (IRB), and consent was secured from the participants' parents or guardians. The children also provided their assent to participate in the study.

In the treatment group, students were nudged to complete their assignments, while being monitored for the completion and submission of the assignments. Academic performance data for both groups was collected across nine standardized tests, with each test period corresponding to a duration of around one month. This longitudinal design enabled a detailed comparison of academic outcomes between centers, specifically between the experimental group using subgoal-oriented nudges and the control group that did not.

Design. Figure 1 presents an overview of the field experiment design. The study employed a field design, beginning with Test 1. After this, students were assigned weekly assignments as part of their coaching, and after four weeks, a comprehensive test was conducted on the topics covered - these tests were labelled as Test 2 through Test 9. Time-period prior to Test 1 is being referred to as time-period 1 and correspondingly the time-period between Test 1 and Test 2 is referred to as time-period 2 (ending with Test 2) and so on, resulting in a total 9 time-periods.

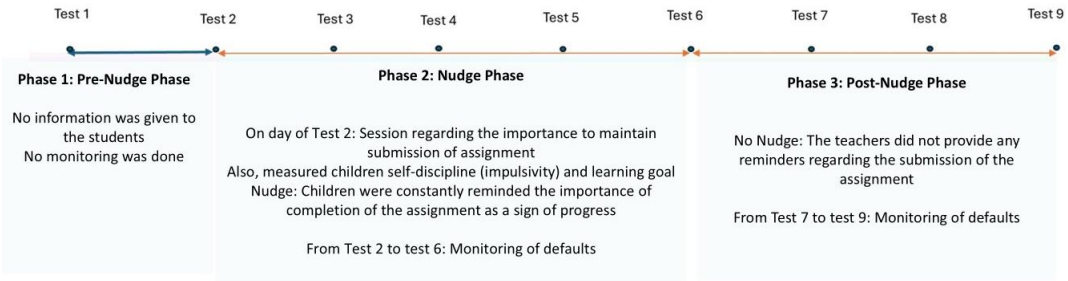

Figure 17: Field Experiment Study Design

The intervention was divided into three distinct phases. **Pre-Nudge Phase:** This phase comprised the time-period 1 and time-period 2 (ending with the completion of Test 2). In this phase, the assignment submission was monitored, but no nudges were provided to encourage assignment completion. On the completion of Test 2 (i.e. completion of the Pre-Nudge Phase), students in the treatment group attended a special session conducted by an instructor. The session emphasized the importance of completing assignments and informed students that their submissions would be

monitored moving forward. In addition, motivational variables, including self-discipline and learning goals, were assessed across both groups to examine individual differences in response to the intervention. The second phase was the **Nudge Phase** comprising of time-period 3 to time-period 6, with each period ending with Test 3 until Test 6. During this period, instructors routinely reminded students about the importance of completing assignments as a sign of progress. A coordinator maintained a record of assignment defaults, which served as a measure of compliance with the intervention. The final phase was the **Post-Nudge Phase** comprising of time-period 7 to time-period 9, each ending with Test 7 until Test 9. In this phase, the instructors ceased reminders about assignment completion, although submissions continued to be monitored. This phase allowed for an analysis of the persistence effect after the removal of nudge.

Measures

Immediately after the completion of Test 2, we measured our key motivational variables of self-discipline and learning goals. These variables were assessed to understand how individual differences in these traits might interact with the subgoal-oriented nudge intervention.

Self-discipline: The Impulsivity Subscale (Eysenck et al., 1984), a validated and widely used measure, which consisting of 23 items was used to measure self-discipline (Duckworth & Seligman, 2006). From these, one items was dropped after a school review, resulting in 22 items. Children's responses included yes-no questions on

impulsive actions and speech (e.g. **“**Do you usually work quickly without bothering to check your answers?**”** and **“**Do you sometimes get so restless that you cannot sit in a chair long?”) (See Appendix for all items)

Learning Goals. Learning goals were assessed to determine whether students were motivated by the desire to acquire knowledge and skills, through an adapted version of the Task Goal Orientation subscale (Midgley et al., 1998), as used in Blackwell et al. (2007)**.** The children answered questions, such as: ***“****An important reason why I do my schoolwork is because I like to learn new things even when it is not easy.”* The students were asked to respond on Likert scale (*1 = "Not at all true," 3 = "Somewhat true," and 5 = "Very true"*) (See Appendix for all three items).

Monitoring and Academic Assessments. Academic performance data were collected across nine standardized tests across the treatment and control groups. From Test 1 onward, corresponding to time-period 2 until time-period 9 assignment submissions were monitored in the treatment group, with default rates tracked for students in the treatment group. The control students were not monitored to maintain the original study the regular way the students were taught.

MODEL 1: IMPACT OF NUDGES ON TEST SCORES

Analysis

To estimate the impact of the subgoal-oriented nudges on academic performance, we performed regression analysis by using the following model:

$$TOT\_SCORE = b_0 + b_1*T_2 + b_2*T_3 + b_3*T_4 + b_4*T_5 + b_5*T_6 + b_6*Female + b_7*Treatment + b_8*Impulsive + b_9*Learning\_goal$$

We used data only from time-period 1 through 6, as the nudge intervention was active during this period. Correspondingly, the test scores from Test 7 to Test 9 were excluded, as the nudge intervention ceased during this phase and we did not want to contaminate our results for the persistence effect of nudges. Additionally, test scores from Test 1 and Test 2 were included in the non-nudge condition, since the intervention had not yet commenced during these time periods.

Results and Discussion

The results support hypothesis 1, proposing that subgoal-oriented nudges positively impact academic performance, as indicated by the significant and positive coefficient for the Treatment variable ($b_7=11.5037, p=0.0015$). This suggests that nudges are effective in enhancing academic performance. Consistent with existing literature, the analysis revealed the following: First, lower self-disciple (high impulsivity measure) negatively impacts academic performance ($b_8=-68.8571, p<0.0001$) meaning that students with lower self-discipline (higher impulsivity scores) tend to perform worse, highlighting the role of self-regulation in academic success. Second, learning goal orientation positively influences performance ($b_9=2.9348, p=0.019$). Students motivated by higher learning goals are more likely to excel

academically. Finally, female students underperform compared to male students ($b_6 = -12.8312, p < 0.0001$).

The table below describes the parameter estimates for the constructs used in the model.

	T_2	T_3	T_4	T_5	T_6
Estimate	13.3065	-19.0805	15.0595	-12.4363	-26.2464
Pr > |t|	0.0059	0.0002	0.0033	0.0206	<.0001

	Parameter	Estimate	Pr > |t|
	Intercept	195.5705	<.0001
6	**Female**	-12.8312	<.0001
7	**Treatment**	11.5037	0.0015
8	**Impulsive**	-68.8571	<.0001
9	**Learning_goal**	2.9348	0.019

Table 8: Parameter estimates of Impact of Nudges on Test Score

MODEL 2: IMPACT OF NUDGES ON PERFORMANCE FOR STUDENTS WITH VARIED SELF-DISCIPLINE

Analysis

To estimate the impact of nudges on performance with different levels of self-discipline, we conducted a regression analysis using the following model:

$$\text{TOT\_SCORE} = b_0 + b_1*T_2 + b_2*T_3 + b_3*T_4 + b_4*T_5 + b_5*T_6 + b_6*\text{Female} + b_7*\text{Treatment} + b_8*\text{Impulsive} + b_9*\text{Learning\_goal} + b_{10}*\text{Treatment}*\text{Impulsive}$$

For this analysis too, we used data from time-period 1 to time-period 6, as the nudge intervention was active during this period. Correspondingly, the test scores from Test 7 to Test 9 were excluded, as the nudge intervention ceased during this phase. Additionally, test scores from Test 1 and Test 2 were included in the non-nudge condition since the intervention had not yet commenced during these time periods.

Results and Discussion

For hypothesis 2, we find partial evidence that nudges benefit impulsive students. The interaction between treatment and impulsiveness ($b_{10}=29.3129, p=0.0743$) is marginally significant, indicating that effect of nudges on performance may be beneficial for children with lower self-discipline, but this effect is not conclusive. The treatment variable ($b_7=-31.3674, p=0.1963$) is insignificant, suggesting that the direct effect of the nudge is not robust. Consistent with the extant research, we find that lower self-discipline (higher impulsivity score) negatively impacts academic performance ($b_8=-76.7256, p<0.0001$), learning goal orientation has a positive influence ($b_9=2.8145, p=0.0244$), and female students underperform compared to male students ($b_6=-13.0761, p<0.0001$).

The table below describes the parameter estimates for the constructs used in the model.

	T2	**T3**	**T4**	**T5**	**T6**
Estimate	13.1675	-18.9953	15.1458	-12.4866	-26.2173
Pr > |t|	0.0064	0.0002	0.0031	0.02	<.0001

	Parameter	Estimate	Pr > |t|
	Intercept	207.7392	<.0001
6	**Female**	-13.0761	<.0001
7	***Treatment***	*-31.3674*	*0.1963*
8	**Impulsive**	-76.7256	<.0001
9	**Learning_goal**	2.8145	0.0244
10	***Treatment*Impulsive***	*29.3129*	*0.0743*

Table 9: Parameter estimates of Impact of Nudges on Self-Discipline

MODEL 3: IMPACT OF NUDGES ON PERFORMANCE FOR DIFFERENT LEVELS OF LEARNING GOALS

Analysis

To estimate the impact of nudges on performance with different levels of learning goal, we conducted a regression analysis using the following model:

$$\text{TOT\_SCORE} = b_0 + b_1*T_2 + b_2*T_3 + b_3*T_4 + b_4*T_5 + b_5*T_6 + b_6*\text{Female} + b_7*\text{Treatment} + b_8*\text{Impulsive} + b_9*\text{Learning\_goal} + b_{10}*\text{Treatment*}\ \text{Learning\_goal}$$

We used data from time-period 1 to time-period 6 as the nudge intervention was active during this period. Correspondingly, the test scores from Test 7 to Test 9 were excluded because the intervention ceased during this phase. Additionally, test scores from Test 1 and Test 2 were included in the non-nudge condition since the intervention had not yet commenced during these time periods.

Results and Discussion

Supporting our hypothesis 3, we find evidence that nudges are more beneficial for students with lower learning goal orientations. The interaction between treatment and learning goals ($b_{10}=-5.0234, p=0.0438$) is significant, suggesting that students with lower learning goal orientation benefit more from the nudge intervention. Additionally, the treatment variable ($b_7=32.0642, p=0.0031$) is significant, indicating a positive impact of the nudge intervention. Consistent with the extant research, we find that lower self-discipline (high impulsivity score) negatively impacts academic performance ($b_8=-67.3622, p<0.0001$), higher learning goal orientation has a positive influence ($b_9=4.6407, p=0.0021$), and that female students underperform compared to male students ($b_6=-12.4275, p<0.0001$).

The table below describes the parameter for the constructs used in the model:

	T2	**T3**	**T4**	**T5**	**T6**
Estimate	13.2493	-19.1579	15.1522	-12.5643	-26.1592
Pr > |t|	0.0061	0.0002	0.0031	0.0191	<.0001

	Parameter	**Estimate**	**Pr > |t|**
	Intercept	186.2913	<.0001
6	**Female**	-12.4275	<.0001
7	**Treatment**	32.0642	0.0031
8	**Impulsive**	-67.3622	<.0001
9	**Learning_goal**	4.6407	0.0021
10	**Treatment*Learning_goal**	-5.0234	0.0438

Table 10: Parameter estimates of Impact of Nudges on Learning Goals

MODEL 4: IMPACT OF NUDGES ON PERFORMANCE ACROSS GENDER

Analysis

In order to estimate the impact of nudges on performance differs across gender, we combined the "Gender" and "Treatment" variables to create a master categorical variable having four categories: FemaleT (Female students in the treatment Group), FemaleNT (Female students in the control), MaleT (Male students in the treatment group), and MaleNT (Male students in the control; also, the reference). As in models 1 to 3, the analysis used data from time-period 1 to time-period 6, as the nudge intervention was active during this period. Correspondingly, the test scores from Test 7 to Test 9 were excluded because the intervention ceased during this phase. Test scores from Test 1 and Test 2 were included in the non-nudge condition since the intervention had not yet commenced during these time periods.

The resulting model was:

$$\text{TOT\_SCORE} = b_0 + b_1*T_2 + b_2*T_3 + b_3*T_4 + b_4*T_5 + b_5*T_6 + b_6*\text{MaleT} + b_7*\text{FemaleNT} + b_8*\text{FemaleT} + b_9*\text{Impulsive} + b_{10}*\text{Learning\_goal}$$

Results and Discussion

Supporting our hypothesis 4a and 4b, the results show gendered differences in the impact of nudges on performance, with positive impact on male students (Male students in the treatment group showed significant improvement ($b_6=22.4553,\ p<0.0001$)) and negative impact on female students (Female students in the treatment group performed worse than the reference group ($b_8=-10.9526,\ p=0.0322$)). Female

students in the non-treatment group showed no significant difference from the reference group ($b_7 = -4.4051, p = 0.2076$). Consistent with the extant research, we find that low self-discipline (high impulsivity score) negatively impacts academic performance ($b_9 = -66.5258, p < 0.0001$), while learning goal orientation has a positive impact ($b_{10} = 3.4483, p = 0.0055$).

The table below describes the parameter estimates for constructs used in the model.

	T2	T3	T4	T5	T6
Estimate	13.2024	-19.0859	14.9534	-12.416	-26.3759
Pr > |t|	0.0057	0.0001	0.0032	0.0194	<.0001

	Parameter	Estimate	Pr > |t|
	Intercept	186.8434	<.0001
6	**MaleT**	22.4553	<.0001
7	***FemaleNT***	*-4.4051*	*0.2076*
8	**FemaleT**	-10.9526	0.0322
9	**Impulsive**	-66.5258	<.0001
10	**Learning_goal**	3.4483	0.0055

Table 11: Parameter estimates of Impact of Nudges on Gender

Model 5: PERSISTENCE IN THE IMPACT OF NUDGES ON PERFORMANCE

Analysis

To estimate the persistence of the impact of subgoal-oriented nudges on academic performance, we utilized data from all time periods. Observations were categorized into three groups: (1) Not_Treated: No nudges applied, (2) Treated: Nudges

were actively applied, and (3) Post_Treated: Nudges were removed, but their potential residual effects were examined

The regression model used was as follows:

$$TOT\_SCORE = b_0 + b_1*T_2 + b_2*T_3 + b_3*T_4 + b_4*T_5 + b_5*T_6 + b_6*T_7 + b_7*T_8 + b_8*T_9 + b_9*Female + b_{10}*Treated + b_{11}*Post\_Treated + b_{12}*Impulsive + b_{13}*Learning\_goal$$

Results and Discussion

Supporting our hypothesis 5, nudges have a persistence effect on academic performance. After nudges were stopped, their positive impact persisted, as seen by the significant coefficient for Post_Treated ($b_{11}=11.1802, p=0.0114$). Students in the treated category showed significant improvement ($b_{10}=11.5848, p=0.002$), supporting the hypothesis that nudges enhance academic performance. Consistent with the extant research, we find that low self-discipline (high impulsivity score) negatively impacts performance ($b_{12}=-64.6181, p<0.0001$), learning goal orientation has a positive impact ($b_{13}=2.9266, p=0.0068$), and female students consistently underperform compared to male students ($b_9=-13.4422, p<0.0001$).

The table below describes the parameter estimates of the constructs used in the model.

	T2	**T3**	**T4**	**T5**	**T6**	***T7***	**T8**	**T9**
Estimate	13.3957	-19.0945	15.0645	-12.4711	-26.286	*1.53*	-31.279	12.3897
Pr > |t|	0.0076	0.0003	0.0046	0.0253	<.0001	*0.7841*	<.0001	0.0216

	Parameter	Estimate	Pr > |t|
	Intercept	189.5942	<.0001
9	**Female**	-13.4422	<.0001
10	**Treated**	11.5848	0.002
11	**Post_Treated**	11.1802	0.0114
12	**Impulsive**	-64.6181	<.0001
13	**Learning_goal**	2.9266	0.0068

Table 12: Parameter estimates of Persistence in the Impact of Nudges on Test Scores

MODEL 6: INTERACTION OF PERSISTENCE OF NUDGES ON PERFORMANCE WITH SELF DISCIPLINE

Analysis

To examine the impact on academic performance of the persistence effect of nudges on self-discipline during the post-nudge period (period corresponding to time-period 7 to time-period 9), we use data from all time periods. We also categorize all observations into three categories: (1) Not_Treated, (2) Treated, and (3) Post_Treated, resulting in the following model:

TOT_SCORE = b0 + b1*T2 + b2*T3 + b3*T4 + b4*T5 + b5*T6 + b6*T7 + b7*T8 + b8*T9 + b9*Female + b10*Treated + b11*Post_Treated + b12*Impulsive + b13*Learning_goal + b14*Treated*Impulsive + b15*Post_Treated*Impulsive

Results and Discussion

We did not find any persistence of nudge on performance with different levels of self-discipline. The interaction terms for Treated*Impulsive *(p=0.1369*) and Post_Treated*Impulsive (*p=0.3188*) are insignificant. This indicates no persistence

effect of nudges on performance for children with different levels of self-discipline, suggesting that students with lower self-discipline require consistent nudges or external reinforcements for sustained improvement. Consistent with previous findings, lower self-discipline (high impulsivity score) students perform worse ($b_{12}=-71.6272$, $p<0.0001$), higher learning goals predict better academic outcomes ($b_{13}=2.8132$, $p=0.0094$), and female students underperform compared to males ($b_{9}=-13.675$, $p<0.0001$).

The table below describes the parameter estimates for the constructs used in the model.

	T2	**T3**	**T4**	**T5**	**T6**	***T7***	**T8**	**T9**
Estimate	13.2724	-19.0209	15.1364	-12.5106	-26.2564	*1.6191*	-31.2673	12.3723
Pr > |t|	0.0082	0.0003	0.0044	0.0248	<.0001	*0.7718*	<.0001	0.0218

	Parameter	**Estimate**	**Pr > |t|**
	Intercept	200.4648	<.0001
9	**Female**	-13.675	<.0001
10	***Treated***	*-24.231*	*0.3194*
11	***Post_Treated***	*-16.8578*	*0.553*
12	**Impulsive**	-71.6272	<.0001
13	**Learning_goal**	2.8132	0.0094
14	***Treated*Impulsive***	*24.4828*	*0.1369*
15	***Post_reated*Impulsive***	*19.1069*	*0.3188*

Table 13: Parameter estimates of Interaction of Persistence of Nudges with Impulsivity

MODEL 7: INTERACTION OF PERSISTENCE OF NUDGES ON PERFORMANCE WITH LEARNING GOALS

Analysis

To examine the impact on academic performance of the persistence effect of nudges on learning goals during the post-nudged period (period corresponding to Test 7 to Test 9), we use data from all time periods. We also categorize all observations into three categories: (1) Not_Treated, (2) Treated, and (3) Post_Treated, resulting in the following model:

$$\begin{aligned}\text{TOT\_SCORE} = {} & b_0 + b_1*T_2 + b_2*T_3 + b_3*T_4 + b_4*T_5 + b_5*T_6 + b_6*T_7 + b_7*T_8 + b_8*T_9 + \\ & b_9*\text{Female} + b_{10}*\text{Treated} + b_{11}*\text{Post\_Treated} + b_{12}*\text{Impulsive} + \\ & b_{13}*\text{Learning\_goal} + b_{14}*\text{Treated}*\text{ Learning\_goal} + b_{15}*\text{Post\_Treated}* \\ & \text{Learning\_goal}\end{aligned}$$

Results and Discussion

Children with lower learning goals continued to benefit even after the nudges ceased although the result was marginally significant ($b_{15}=-4.9597,\ p=0.0825$). In lines with our pervious findings and confirming the hypothesis 3, students with lower learning goals are benefitted more from the impact of the nudges on performance during the nudge phase ($b_{14}=-5.1509,\ p=0.038$), lower self-discipline (higher impulsivity score) corresponds to lower performance ($b_{12}=-62.7682,\ p<0.0001$), higher learning goals corresponds to superior performance ($b_{13}=4.9549,\ p=0.0003$), and females continue to underperform males ($b_9=-12.912,\ p<0.0001$).

The table below describes the parameter estimates for the constructs used in the model.

	T2	**T3**	**T4**	**T5**	**T6**	***T7***	**T8**	**T9**
Estimate	13.3283	-19.1738	15.1568	-12.6059	-26.1951	*1.7019*	-31.3594	12.5126
Pr > |t|	0.0078	0.0003	0.0043	0.0235	<.0001	*0.7602*	<.0001	0.0202

	Parameter	**Estimate**	**Pr > |t|**
	Intercept	178.4354	<.0001
9	**Female**	-12.912	<.0001
10	**Treated**	32.6627	0.0026
11	**Post_Treated**	31.5478	0.0123
12	**Impulsive**	-62.7682	<.0001
13	**Learning_goal**	4.9549	0.0003
14	**Treated*Learning_goal**	-5.1509	0.038
15	***Post_reated*Learning_goal***	*-4.9597*	*0.0825*

Table 14: Parameter estimates of Interaction of Persistence of Nudges with Learning Goals

MODEL 8: INTERACTION OF PERSISTENCE OF NUDGES ON PERFORMANCE WITH GENDER

Analysis

To analyze the impact of nudges on academic performance varied with gender during the post-nudge period (time-period 7 to time-period 9), we categorized observations (Gender and Treatment) into six groups by combining gender and treatment status: FemaleT: Female students treated during the nudge phase; FemaleNT: Female students not treated; FemalePT: Female students post-treated (nudges stopped);

MaleT: Male students treated during the nudge phase; MaleNT: Male students not treated (reference category); and MalePT: Male students post-treated (nudges stopped). The following model was used:

$$\begin{aligned}\text{TOT\_SCORE} = {} & b_0 + b_1*T_2 + b_2*T_3 + b_3*T_4 + b_4*T_5 + b_5*T_6 + b_6*T_7 + b_7*T_8 + b_8*T_9 + \\ & b_9*\text{MaleT} + b_{10}*\text{MalePT} + b_{11}*\text{FemaleNT} + b_{12}*\text{FemaleT} + b_{13}*\text{FemalePT} + \\ & b_{14}*\text{Impulsive} + b_{15}*\text{Learning\_goal}\end{aligned}$$

Results and Discussion

Our hypothesis posits that nudges have a significant positive effect on male students during the nudge phase ($b_9=23.2954,\ p<0.0001$), and confirm the earlier analysis. Furthermore, the positive effect persists post-intervention ($b_{10}=22.8548,\ p<0.0001$) indicating that positive nudges effect on performance persists in male students even after the nudges are stopped. Conversely, nudges negatively impact female students during the nudge phase ($b_{12}=-10.4836,\ p=0.0457$), and confirms the earlier analysis. Furthermore, the negative effect persists although marginally during the post-nudge phase ($b_{13}=-11.3404,\ p=0.0702$).

No significant difference is observed between females and the reference category when no treatment is applied ($b_{11}=-2.8437,\ p=0.36$). Based on the extant literature and consistent throughout our analysis, lower self-discipline (higher impulsivity score) negatively impacts performance ($b_{14}=-61.3362,\ p<0.0001$), while higher learning goals correspond to improved outcomes ($b_{15}=3.6543,\ p=0.0007$).

The table below describes the parameter estimates for the constructs used in the model.

	T2	**T3**	**T4**	**T5**	**T6**	***T7***	**T8**	**T9**
Estimate	13.2675	-19.1218	14.9461	-12.4364	-26.4559	*1.2307*	-31.6438	11.9928
Pr > |t|	0.0074	0.0002	0.0044	0.0237	<.0001	*0.8232*	<.0001	0.0242

	Parameter	**Estimate**	**Pr > |t|**
	Intercept	177.7702	<.0001
9	**Male_T**	23.2954	<.0001
10	**Male_PT**	22.8548	<.0001
11	***Female_NT***	*-2.8437*	*0.36*
12	**Female_T**	-10.4836	0.0457
13	***Female_PT***	*-11.3404*	*0.0702*
14	**Impulsive**	-61.3362	<.0001
15	**Learning_goal**	3.6543	0.0007

Table 15: Parameter estimates of Interaction of Persistence of Nudges with Gender

MODEL 9: IMPACT OF ASSESSMENT COMPLETION ON TEST SCORES

Analysis

We next wanted to understand the relationships between assessment completion (default) and academic performance. To do so, we modelled the impact of defaults on test scores. Data from students only in the treatment group were analyzed, as assignment tracking was exclusive to this group. Time-periods 1 and 2 were excluded (pre-nudge) because there was no nudge given during this period. Additionally, we appropriately used dummy variables to separate out the time-period 7 to 9 (post-nudge) resulting in the following model:

$$TOT\_SCORE = b_0 + b_1*Defaults + b_2*Time + b_3*Time*Time + b_4*Time*Time*Time + b_5*Post\_Treated + b_6*Female + b_7*Impulsive + b_8*Learning\_goal$$

Results and Discussion

We find that the defaults have a negative impact on scores ($b_1=-1.2383, p=0.0028$). Confirming existing literature, low self-discipline (high impulsivity score) results in lower performance on scores ($b_7=-38.807, p=.0008$) and females underperform males ($b_6=-35.7901, p<.0001$).

The table below describes the parameter estimates for the constructs used in the model.

	Parameter	**Estimate**	**Pr > |t|**
	Intercept	80.7229	0.0028
1	**Defaults**	-1.2382	0.0092
2	**Time**	120.054	<.0001
3	**Time*Time**	-38.09	<.0001
4	**Time*Time*Time**	3.1665	<.0001
5	**Post_Treated**	53.0437	<.0001
6	**Female**	-35.7901	<.0001
7	**Impulsive**	-38.807	0.0008
8	***Learning_goal***	1.3889	0.3911

Table 16: Parameter estimates of Impact of Assessment Completion on Test Scores

In this model, however, defaults were potentially endogenous. Therefore, this endogeneity must be accounted for in our model estimation, which is done in model 10.

MODEL 10: IMPACT OF ASSIGNMENT COMPLETION ON PERFORMANCE AFTER CORRECTING FOR ENDOGENEITY

Analysis

In every time-period, the number of assignments given varied and we used this variance as an instrumental variable to address for endogeneity.

Stage-1 Model: Instrumental Variable Model

The relationship between defaults and explanatory variables was modelled using a logit link function:

$$\text{Logit}(p\_it) = b_0 + b_1\text{*Assignments} + b_2\text{*Time} + b_3\text{*Time*Time} + b_4\text{*Time*Time* Time} + b_5\text{*Post\_Treated} + b_6\text{*Female} + b_7\text{*Impulsive} + b_8\text{*Learning\_goal}$$

The key result here is that 'Assignment' is a strong instrument (*b1=−0.088*).

The table below describes the parameter estimates for the constructs used in the model.

	Parameter	**Estimate**	**Pr > ChiSq**	**Odds Ratio**
	Intercept	-4.487	<.0001	
1	**Assignments**	-0.1072	<.0001	0.898
2	**Time**	3.3523	<.0001	28.568
3	**Time*Time**	-0.5095	<.0001	0.601
4	**Female**	-0.2918	<.0001	0.747
5	**Impulsive**	0.9628	<.0001	2.619
6	***Learning_goal***	*0.0315*	*0.2228*	*1.032*

Table 17: Parameter estimates before correcting for endogeneity of Defaults

Stage 2: Adjusted Model with Residuals

The residuals from stage 1 were incorporated into the following model:

$$TOT\_SCORE = b_0 + b_1*Defaults + b_2*Time + b_3*Time*Time + b_4*Time*Time*Time + b_5*Post\_Treated + b_6*Female + b_7*Impulsive + b_8*Learning\_goal + b_9*Residuals$$

Results and Discussion

We find that after correcting for endogeneity, defaults positively impact test scores (*b1=7.3378, p=0.0173*), contrary to the stage 1 results. Low self-discipline (High impulsivity score) negatively affects performance (*b7=−67.6073, p<0.0001*) and female students underperform males (*b6=−28.7825, p<0.0001*). The significant coefficient for residuals (*b9=-8.7189, p=0.0049*) confirms the presence of endogeneity in the uncorrected model.

The table below describes the parameter estimates for the constructs used in the model.

	Parameter	**Estimate**	**Pr > |t|**
	Intercept	196.9918	<.0001
1	**Defaults**	7.3378	0.0173
2	***Time***	6.8403	0.8793
3	***Time*Time***	-8.1494	0.5051
4	***Time*Time*Time***	0.6474	0.5251
5	**Post_Treated**	80.5421	<.0001
6	**Female**	-28.7825	<.0001
7	**Impulsive**	-67.6073	<.0001
8	***Learning_goal***	0.5918	0.7165
9	**Residuals**	-8.7189	0.0049

Table 18: Parameter estimates after correcting for endogeneity of Defaults

A priori, we hypothesized that compliance with assignment completion and submissions would explain the improvement in academic performance. However, after correcting for endogeneity, the findings suggest the opposite, that is, students with higher defaults performed better. This counter-intuitive result may reflect that defaults are not indicative of a lack of effort but rather meaningful engagement with assignments. While students may have spent time attempting assignments, they may not have felt the need to complete/submit them for two plausible reasons. The first is the perceived redundancy of assignment. Students who believed they already knew the answers may have viewed completion/submission as unnecessary and instead focused their efforts elsewhere. The second is task difficulty. Students may have struggled to complete the assignments due to their difficulty, despite their efforts and, thus, not submitted them.

Existing research suggests that children possess the ability to strategically allocate their time and resources, which may explain the non-completion of assignments despite meaningful engagement. To further explore this alternative mechanism, we conducted interviews with two program coordinators who reported two recurring concerns. The first was the perceived redundancy among high-performing students who saw assignments as a waste of time, believing they already understood the material. The second reason involved students who spent significant time on assignments but couldn't complete them due to time constraints, requiring them to spend significant time to

review material and online resources to deepen their understanding, resulting in time constraints that prevented them to complete and submit the assignment.

GENERAL DISCUSSION

This study examines the impact of subgoal-oriented nudges in improving academic performance, particularly among students preparing for a highly competitive examination. The findings are that nudges effectively improve test scores during the intervention phase, with the greatest benefits for students with lower self-discipline and lower learning-goal motivation. This suggests that nudges provide critical external scaffolding for students who struggle with intrinsic regulation and motivation. Gender differences also emerged as a significant factor, with male students showing sustained performance improvements, while female students experienced negative impacts, likely due to the autonomy-undermining nature of external factors. Importantly, the benefits of nudges persisted even after the intervention ceased, indicating partial internalization of routines and habits among participants. A particularly intriguing finding was that higher assignment defaults were associated with better test performance, suggesting that students have an ability for strategic allocation of resources and are able to prioritize effort based on their requirements.

The practical implications of these findings are substantial. Educational institutions can incorporate nudge-based interventions to improve outcomes for students with lower self-regulation and lower learning-goal motivation. Tailored approaches that

consider individual traits, such as gender, may further optimize these interventions. Additionally, the principles of subgoal-oriented nudges may extend beyond education to other domains, such as healthcare, workplace productivity, and environmental sustainability, where structured behavioral prompts can drive meaningful outcomes. For instance, subgoal-oriented nudges could be employed to encourage medication adherence, physical activity, and sustainable practices. Involving parents in reinforcing subgoals at home could also amplify the effectiveness of such interventions and ensure their success.

The study also makes significant theoretical contributions. By extending the application of nudge theory to competitive academic settings, it highlights the potential of these interventions in contexts requiring sustained self-regulation and motivation. The findings contribute to the literature on self-regulation and learning-goal motivation by demonstrating how external factors can scaffold intrinsic traits. The observed gender differences add to the existing theories, such as Self-Determination Theory, Attribution Theory, and Expectancy-Value Theory, highlighting how external interventions can affect male and female students differently. The persistence of nudge effects also offers insights into habit formation, supporting theories that suggest repeated behaviors under supportive conditions can lead to automaticity.

Future research should focus on several key areas to build on these findings. First, studies can explore the scalability of subgoal-oriented nudge-based interventions using digital platforms, such as apps or online tools, which can provide real-time

reminders and track progress. Second, designing gender-sensitive nudges that enhance autonomy and intrinsic motivation, particularly for female students, is crucial to address the observed disparities. Third, expanding the application of subgoal-oriented nudges to domains, such as health, financial planning, and environmental behavior could validate their versatility and societal impact. Lastly, exploring alternative mechanisms, such as social nudges or peer influence, could complement subgoal-oriented strategies and offer new avenues for enhancing behavioral outcomes. Overall, this research highlights the transformative potential of subgoal-oriented nudges in supporting positive behaviors and achieving long-term goals across diverse settings.

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CHAPTER IV:

CONCLUSION AND FUTURE DIRECTION

Across two essays, this dissertation explores the effects of receiving versus expressing gratitude on prosocial behavior and external nudges on academic performance. The findings contribute to the broader literature on motivation, child development, and educational interventions, offering significant theoretical and practical insights for educators, parents, policymakers, and marketing professionals in the education domain.

The first essay highlights that receiving gratitude fosters greater gratitude and prosocial behavior compared to expressing gratitude. While previous research primarily emphasizes the benefits of expressing gratitude (Emmons & McCullough, 2003), our findings demonstrate the role of external reinforcement -in the form of receiving gratitude, in encouraging children to persist in their efforts and engage in prosocial behaviors. This challenges the conventional notion that gratitude is solely an internalized emotion and instead positions it as an external reinforcement mechanism that, when structured effectively, can positively impact children's motivation and social engagement (Algoe, 2012).

The second essay examines the effect of external nudges on academic performance, revealing that nudging for structured study through assignments completion and submission can enhance academic outcomes. The findings contribute to research on habit formation and self-regulation (Duckworth & Seligman, 2005; Zimmerman, 2002) by demonstrating that nudges can mitigate the effects of low self-discipline, and low learning-goal motivation. However, the findings also highlight the

divergent impact of nudges on gender, as they have a detrimental effect on female students, emphasizing that a one-size-fits-all approach is ineffective when accounting for individual differences in human behavior (Eccles, 1999).

Together, these essays provide evidence that external factors play a crucial role in shaping children's developmental trajectories. These insights have significant implications for the design of educational policies, parental strategies, and behavioral interventions that seek to promote long-term growth and resilience in children.

This dissertation makes several key theoretical contributions. First, it expands the understanding of external reinforcement within motivation research. While Self-Determination Theory (Ryan & Deci, 2000) emphasizes the importance of intrinsic motivation, this research demonstrates that external factors can be critical for fostering long-term behavioral change. Specifically, receiving gratitude and nudges for assignment completion and submission can help with desired behavior over the period.

Second, this dissertation bridges the gap between habit formation and nudges. Prior research suggests that behaviors must be repeated in stable environments to become habits (Lally et al., 2010). This study extends that notion by showing that external enforcement can scaffold self-discipline and lower motivation. This research offers a more comprehensive view of the development and persistence of desired behaviors (Baumeister & Tierney, 2012) through use of nudges as scaffolders to mitigate the negative impact of low regulation and motivation.

Third, this dissertation challenges traditional conceptualizations of gratitude by framing it as both an internal emotion and an external motivator, which need not be targeted towards specific benevolent acts. The findings indicate that receiving gratitude serves as a powerful external reinforcer of behavior, strengthening gratitude. This novel perspective broadens the understanding of gratitude's role and provides practical insights into how receiving gratitude can enhance gratitude.

Finally, this research demonstrates that educational environments play a critical role in shaping both values and academic excellence in children. Schools and educators have the potential to create structured and supportive environments that guide children toward greater motivation and performance while acknowledging individual differences in response to external reinforcement strategies (Wentzel, 1998).

Limitations and Future Directions

While this research provides valuable insights, several limitations offer opportunities for further exploration. One key limitation of the studies is that it captures immediate effects rather than long-term behavioral change. Future research should adopt longitudinal designs to examine whether gratitude and discipline interventions lead to sustained self-regulation over extended periods (Heckman & Kautz, 2012).

Additionally, individual differences in response to external reinforcement remain an open question. While this research assumes that external reinforcement benefits most children, personality traits, such as conscientiousness may moderate these

effects (Roberts et al., 2009). Future studies should explore how individual characteristics influence the effectiveness of external motivation strategies.

Cultural and contextual variations also warrant further exploration. The role of external reinforcement may vary across cultural and socioeconomic contexts (Markus & Kitayama, 1991). In collectivist cultures, where social cohesion is emphasized, receiving gratitude may have a stronger impact compared to individualistic cultures that prioritize autonomy (Triandis, 1995).

Another promising direction for future research is examining alternative forms of external reinforcement. While this dissertation focuses on receiving gratitude and nudges, other mechanisms, such as mentorship, gamified learning experiences, and social validation may also foster intrinsic motivation (Hamari et al., 2014).

Future studies should also explore the optimal balance between external reinforcement and intrinsic motivation. While external reinforcement can initiate positive behaviors, overreliance on external motivators may inhibit the development of self-driven persistence (Ryan, 2017).

Concluding Remarks

To date, business scholars have devoted limited attention to education as a mainstream subject of inquiry and scholarship. Yet, education is one of the most resource-intensive and consequential sectors globally, impacting both its consumers - students and parents and its providers - schools, educators, and policymakers (Grewal et

al., 2022). This dissertation aims to bridge this gap by highlighting the significance of education for business research, encouraging a diverse set of scholars to engage with this sector more rigorously. By doing so, scholars from diverse field can help enhance educational outcomes.

Furthermore, in the digital age, the relevance of traditional schools has been increasingly questioned, with technology-driven alternatives such as online learning platforms, AI tutors, and personalized education models challenging conventional educational institutions. This dissertation underscores the irreplaceable role of schools in the formation of early values and interpersonal skills. Schools serve as primary environments for socialization that foster academic learning and critical life skills such as collaboration, resilience, and ethical reasoning. Despite technological advancements, schools will remain vital institutions for years to come, shaping future generations in ways that cannot be fully replicated in virtual settings.

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APPENDIX

Chapter 2:

Measurement	Study	Scale
Prosocial intention	Study 1	The participants read five brief scenarios, each providing an opportunity for prosocial behavior and then indicated how likely they would be to engage in the behavior described (1 = Absolutely not, 2 = Probably not, 3 = I'm not sure, 4 = Probably yes, 5 = Absolutely yes). **Scenario 1: Playground Kindness** Imagine you see a new student sitting alone on the playground during recess. Would you go over and invite them to join in a game with you and your friends? **Scenario 2: School Supply Sharing** Imagine a classmate forgot to bring their pencil to school, and they ask to borrow one from you during class. Would you lend them your extra pencil? **Scenario 3: Community Clean-Up** Imagine your neighborhood association is organizing a clean-up day at the local park to pick up litter and make

		the park look nice. Would you volunteer to help clean up? **Scenario 4: Volunteering at an Animal Shelter** Imagine there's an animal shelter nearby that needs volunteers to help care for pets. Would you be interested in volunteering your time to help take care of animals in need? **Scenario 5: School Fundraiser Support** Imagine your school is holding a fundraiser to support a local charity. Would you participate by selling items or helping to organize the event?
Grit	Study 3	Below is a list of statements on various things you may have encountered. Please indicate how strongly you agree or disagree (1= Completely Disagree; 2= Disagree; 3=Agree and 4= Completely Agree) with each statement. There are no right or wrong answers. 1. I like schoolwork best which makes me think hard, even if I make a lot of mistakes. 2. If I set a goal and see that it's harder than I thought, I easily lose interest. *

		3. If I think I will lose in a game, I do not want to continue playing. * 4. I prefer easy homework where I can easily answer all questions correctly. * 5. Setbacks discourage me. * 6. I work hard in tasks. 7. When I receive a bad result on a test, I spend less time on this subject and focus on other subjects that I'm actually good at. * 8. If I'm having difficulty in a task, it is a waste of time to keep trying. I move on to things which I am better at doing. * *Reverse coded
Self – Esteem	Study 3	Below is a list of statements dealing with your general feelings about yourself. Please indicate how strongly you agree or disagree (1= Strongly Disagree; 2= Disagree; 3=Agree and 4=Strongly Agree) with each statement. 1. On the whole, I am satisfied with myself. 2. At times I think I am no good at all *.

		3. I feel that I have a number of good qualities. 4. I am able to do things as well as most other people. 5. I feel I do not have much to be proud of*. 6. I certainly feel useless at times*. 7. I feel that I'm a person of worth, at least on an equal plane with others. 8. I wish I could have more respect for myself*. 9. All in all, I am inclined to feel that I am a failure*. 10. I take a positive attitude toward myself. *Reverse coded

CHAPTER 3:

Measurement	Scale
Impulsivity Subscale	Instructions: Please answer each question by putting a circle around the "YES" or the "NO" following the question. There are no right or wrong answers and no trick questions. Work quickly and do not think too long about the exact meaning of the question. • Do you sometimes get so restless that you cannot sit in a chair long? • Do you often long for excitement? • Do you often buy things on impulse? • Do you generally do and say things without stopping to think? • Do you often get into a jam because you do things without thinking? • Do you usually work quickly without bothering to check your answers? • Do people you are with have a strong influence on your moods? • Are you an impulsive person? • Do you often do things on the spur of the moment? • Do you sometimes break rules on the spur of the moment? • Do you mostly speak before thinking things out?

	• Do you often get involved in things you later wish you could get out of? • Do you get so “carried away” by new and exciting ideas, that you never think of possible snags? • Do you get bored more easily than most people, doing the same old things? • Do you think that planning takes the fun out of things? • Do you need to use a lot of self control to keep out of trouble? • Are you often surprised at people’s reactions to what you do or say? • Do you get very annoyed if someone keeps you waiting? • Do you get very restless if you have to stay around home for any length of time? • Do you sometimes put down the first answer that comes into your head, during a test and forget to check it later? • Do you save regularly? * • Do you usually think carefully before doing anything? * *Reverse coded

Learning Goal	Instructions: Read each sentence below and then circle the one number that shows how much you agree with it. There are no right or wrong answers. • An important reason why I do my assignment is because I like to learn new things even when it is not easy. • I like the assignments best when it really makes me think or conflicts with short term performance • I like assignments that I'll learn from, even if I make a lot of mistakes. 1 = Strongly Disagree 2 = Disagree 3 = Slightly Disagree 4= Slightly Agree 5 = Agree 6 = Strongly Agree