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Testing the Motivational Theory of Role Modeling in First- and Continuing-Generation College Students: A Scale Development Approach

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Abstract

The Motivation Theory of Role Modeling suggests that role models can serve three functions for role aspirants –being inspirational, behavioral guides, or representing what is possible. To date, however, no measure exists which can distinguish between these functions or test predictions from this theory. In the current investigation, we conducted four studies (total n = 1,448) to develop such a measure and use it to test predictions in first-generation and continuing-generation college students. Consistent with the theory, items describing these three functions could be distinguished in factor analyses, and first-generation students reported lower availability of academic role models serving all three functions. Availability of academic models serving these three functions was related to greater academic achievement and commitment. Support for nuanced predictions from this theory was mixed, however, with associations for the inspirational model scale being the most supported. Inspirational models appeared to indirectly contribute to benefits theorized to result from other functions, possibly because inspiration is a precondition to those benefits. Broadly, the four studies' results support the continued relevance of the theory, develop measures to assess availability of each role model

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Data Availability Statement included at the end of the article

type and support relationships of role model availability's importance for understanding first-generation college students' reduced commitment to academic goals.

Keywords
role models, motivation, first-generation college students, persistence

Introduction

The American collegiate system is widely thought to provide opportunities for underprivileged individuals to achieve the American dream. Despite this, First-Generation college students (i.e., whose parents have not received a college degree) are more likely to drop out of higher education than Continuing-Generation college students (i.e., with at least one parent that completed a college degree; Radunzel, 2021), especially in the high-demand fields of science, technology, engineering, or mathematics (STEM; Chen & Carroll, 2005). Given this, how can we improve First-Generation college students' retention in higher education?

One contributing factor is First-Generation college students' reduced role model availability (Stephens et al., 2014; Trenor et al., 2008). The Motivational Theory of Role Modeling proposes that role models play three functions in helping individuals pursue goals (e.g., earning a college degree; Morgenroth et al., 2015). The present studies aim to test this theory by developing an instrument to measure these functions.

The Motivational Theory of Role Modeling (MTRM)

Morgenroth et al. (2015) propose that role models play three main functions in motivating role aspirants (i.e., a person who seeks to emulate a role model): (1) Inspirational models, (2) Behavioral models, and (3) Representations of the Possible. *Inspirational models* are individuals who show aspirants that a new goal is desirable (Porter & Serra, 2020). For example, Almquist and Angrist (1971) found that exposure to female role models in the work force inspired young women to pursue career goals as well. However, First-Generation students have fewer role models available, as their parents work in far different occupations (Trenor et al., 2008).

Behavioral models help aspirants learn specific skills needed to pursue a goal. Bandura's (1989) classic Social-Cognitive Learning Theory focuses on how role aspirants can learn skills by emulating behaviors of experienced individuals (Porter & Serra, 2020). For example, BarNir et al. (2011) found that exposure to entrepreneurial role models significantly increases women's intentions to enter this counter-stereotypical profession, and that this was due to an increase in their self-perceived entrepreneurial ability. Again, however, First-Generation students' lack of role models creates an obstacle to observational skill acquisition (Trenor et al., 2008).

Representations of the Possible are individuals from one's own group that show aspirants what is attainable for their group (Olsson & Martiny, 2018). They are of course particularly important for members of underrepresented groups, who doubt whether a person like them can achieve a given goal (e.g., earn a college degree). For example, Stout et al. (2011) found that exposure to an in-group role model (i.e., a female STEM expert) increased STEM self-efficacy and effort on STEM tests for female students. Similarly, Stephens et al. (2014) found that exposure to older First-Generation students improved academic performance.

Expectancy-Value Theory of Motivation

Drawing on expectancy-value theory of motivation (Beckmann & Heckhausen, 2018; Eccles & Wigfield, 2002), Morgenroth et al. (2015) suggested that the different functions of role models affect role aspirants' motivation in distinct ways. Expectancy refers to an individual's perceived likelihood of success. Value refers to how desirable an individual finds a goal. The modern expectancy-value theory recognizes the costs and benefits of each choice by an individual weighing the value of a goal and the probability of success at attaining that goal (Eccles & Wigfield, 2002), such that the choice with the highest incentive (i.e., value) and probability of success (i.e., expectancy) is the most likely to be made (Beckmann & Heckhausen, 2018).

Morgenroth et al. (2015) propose that inspirational models influence the value of a goal, and that they do so through three distinguishable processes. The first process is identification, where a role aspirant desires to be like the role model. The second process is internalization, where the role aspirant adopts similar goals for the self. This process reflects similar functions of internalization from Self-Determination Theory, where the goal demonstrated by the role model is integrated by the role aspirant (Deci et al., 1994). Finally, the third process is admiration, where the role model must be perceived as desirable by the role aspirant. Past research has examined this proposal mainly in relation to social influence on changing attitudes (e.g., Wentzel, 2021). O'Brien et al. (2017) found that after consideration of a scientist role model that they liked (i.e., admiration), role aspirants had increased sense of fit (i.e., internalization) and identification with science.

By contrast, behavioral models are proposed to influence expectancy of success through the process of vicarious learning (Morgenroth et al., 2015). Through vicarious learning, behavioral role models may increase perceived self-efficacy, (Bartsch et al., 2012; Han et al., 2021). Consistent with this, Bartsch et al. (2012) found that exposure to a role model who specifically outlines how they achieved success in statistics increased students' self-efficacy in statistics.

Finally, representations of the possible are proposed to influence expectancy of success in two distinct ways (Morgenroth et al., 2015). First, they can help undo negative self-stereotyping. Often, group-based perception of abilities can influence expectancy (Rudman & Phelan, 2010). Representations of the possible help to challenge these negative self-stereotypes, allowing the individual to develop a new, positive identification with the aspirational group (e.g., scientists). Second, representations of the possible can alter aspirants' perception of barriers. For example, First-Generation college students may come to think of the financial obstacles they face as surmountable, once they see that other First-Generation students have overcome them.

Previous Research Examining the Motivational Theory of Role Modeling

While there is empirical support for the three role model functions outlined in the MTRM, past studies testing it largely rely on ad hoc measures that have not been fully validated (Flake et al., 2017; Flake & Fried, 2020), and which do not separately assess the different functions of role models. While the reliance on ad hoc scales is understandable in the absence of a validated measure, it nonetheless introduces ambiguity, compromises the validity of studies, and poses a significant barrier to continued scientific progress (Flake et al., 2017; Flake & Fried, 2020).

For example, Gartzia et al. (2021) conducted four studies examining the effect of the availability of attainable role models on student and employee motivation. To measure the availability of attainable role models, they used items such as "Being like people who inspire me seems attainable" and "There are people in my discipline that I think I can be like if I want to" (Gartzia et al., 2021, p. 594), though the exact items used varied across studies. Evidence was presented that some measures of role model availability were internally reliable, and that they were related to consequential outcomes (e.g., expectancy of success, motivation). However, other standard aspects of scale development and construct validation (e.g., factor analysis, known groups, convergent and discriminant validity; see Flake et al., 2017) were not examined. Perhaps more importantly, the items used did not clearly differentiate between the different functions of role models proposed within MTRM.

Similarly, Chen et al. (2024) examine how positive perceptions of STEM professionals are related to STEM career aspirations. To measure positive perceptions of STEM professionals, they used eight items asking if STEM professionals "are good at math", "have a high income", or "are respected by people" (among other items). They conducted a confirmatory factor analysis to ensure that items loaded onto a single factor. They also provided evidence that this scale was internally reliable, and that it was associated with a consequential outcome (i.e., STEM career aspirations). Again, however, other aspects of construct validation were not addressed (e.g., differences between known groups; convergent & discriminant validity), and the scales did not differentiate between different role model functions.

Given this, we sought to develop and validate a measure of role model availability that could clearly distinguish between the different functions of role models proposed within MTRM.

The Current Studies

While past research certainly supports many postulates of the MTRM, important gaps remain. The current investigation was designed to fill these gaps and address five important aims. First, while brief ad-hoc items have been used to assess role models (Gartzia et al., 2021), no validated measure currently exists that separately measures aspirants' perceptions of three functions of role models. Thus, the first purpose of the current investigation was to construct and validate a measure of these functions according to standard criteria in the scale development and construct validation literature (Clark & Watson, 1995, 2019; Flake et al., 2017). To do so, we first closely reviewed the literature to generate candidate items that could measure the depth and breadth of the construct under consideration. We then examined if perceptions of the three role model functions proposed in MTRM are distinguishable in factor analyses (*Hypothesis 1*; see Table 1 for an overview of all hypotheses). We first developed a General Role Model Questionnaire (Study 1–2) and later adapted it to measure the availability of STEM

Table 1. Summary of Hypotheses

Hypothesis Number	Description of Hypothesis
1	Three role model functions (inspirational, behavioral, and representations of the possible models) will form distinguishable factors (on all questionnaires)
2	For all three role model functions (on all questionnaires), first-generation students will perceive lower role model availability compared to continuing-generation students
3	All three role model functions (from the STEM & college questionnaire) will be positively correlated with academic achievement (general, STEM-specific)
4	All three role model functions (college, STEM) will be positively correlated with commitment to complete College/STEM degree
5	Inspirational models will exhibit a stronger positive correlation with the perceived value of achieving a corresponding goal (e.g., earn a STEM degree or any college degree), compared to other role model types.
6	Inspirational models will exhibit a stronger positive correlation with internalized motivation to achieve a corresponding goal (e.g., earn a College/STEM degree) and identification with college students/STEM-field, compared to other role model types.
7	Behavioral models will exhibit a stronger positive correlation with the perceived expectancy of achieving a corresponding goal (e.g., earn a STEM/College degree), compared to inspirational models.
8	Representations of the possible will also exhibit a stronger positive correlation with the perceived expectancy of achieving a corresponding goal (e.g., earn a STEM/College degree), compared to inspirational models.
9	Representations of the possible will exhibit a stronger positive correlation with positive self-stereotyping (compared to other role model types) and a stronger inverse correlation with negative self-stereotyping (compared to the other role model types).
10	Representations of the possible will exhibit a stronger, inverse correlation with perceived barriers to goal achievement (e.g., earn a STEM/College degree), compared to the other role model types.

Role Models (Studies 2–4), and role models for success in college more generally (Studies 3–4). For each version of the questionnaire developed, we conducted an exploratory factor analysis in an initial study, and then conducted a confirmatory factor analysis in the follow-up study.

As a second step to validating this measure, we examined if *groups known* to differ in role model availability actually report lower role model availability across all three functions (Flake et al., 2017). We focused on first-generation college students because the lack of available role models is arguably a core barrier to their success in college (Stephens et al., 2012). We thus examined if first-generation students report lower availability of each function, relative to continuing-generation students (*Hypotheses 2*). We examined this prediction in relation to general, college-specific, and STEM-specific role models to ascertain the generality of effects.

Third, we examined if this measure was positively related to consequential criterion variables (Flake et al., 2017). More specifically, we examined if role model availability was positively related to the achievement of higher grades (*Hypothesis 3*) and the commitment to earn a degree (*Hypothesis 4*). Building on the general principle of correspondence (e.g., Ajzen & Fishbein, 1977), we focused our hypotheses and analyses on outcomes that matched the role model questionnaires. For example, college-student and STEM-specific role model availability were expected to be positively associated with commitment to earn any college degree/overall GPA and commitment to earn a STEM degree and STEM grades (respectively). No parallel hypothesis was made for the General questionnaire, as it did not reference any particular outcome. Although prior research suggests that role model availability will be broadly beneficial in this regard, neither previous theory nor previous research makes it clear if any one role model function should be more important than others. As such, we hypothesized that all role model functions should be positively related to commitment and grade achievement at the zero-order level in simple correlational analyses.

Finally, we examined the convergent and discriminant validity of the three functions of role models (Flake et al., 2017), by examining if these functions relate to differential psychological processes as predicted by MTRM (Morgenroth et al., 2015). We hypothesized Inspirational Models would be related to finding greater Value in a college degree (*Hypothesis 5*), as well as having a more Internalized (rather than external) Motivation to earn a degree (*Hypothesis 6*) and Inspirational Models should be more strongly related to each relevant outcome compared to other role model functions. Beyond this, we expected both Behavioral Models and Representations of the Possible to positively relate to Expectancies of success in earning a degree (*Hypotheses 7&8*, respectively) and, these two role model functions should be more strongly related to Expectancies of success compared to Inspirational Models. Furthermore, we hypothesized that Representations of the Possible would be related to more Positive (and less Negative) Self-Stereotyping and greater Identification with the aspirational group (*Hypothesis 9*) and the perception of fewer Barriers (*Hypothesis 10*) and that Representations of the Possible should be more strongly related to these outcomes compared to other role model functions. For all hypotheses, we focused analyses on outcomes corresponding to the role model questionnaire (e.g., perceived value of a STEM degree for the STEM role models questionnaire).

Open Science Practices

We report all measures, sample size determinations, and exclusions. There were no experimental manipulations. Our verbatim method files, data, and analytic code are available here.

Studies 1–4

We conducted four studies. To simplify the presentation, we report all studies together. Study 1 used an undergraduate sample from our home institution to begin developing a general measure of role model availability. This was an important first step that could produce a questionnaire that could be later adapted to refer to different goals. Nonetheless, it could potentially refer to role models of an entirely non-academic nature, and thus it provided a weak test of hypotheses 2-3. To rectify this, Study 2 used another undergraduate sample to begin developing a STEM-specific role model scale and further examine the general scale. Study 3 recruited a more diverse sample of undergraduate students from many institutions using Prolific Academic (Peer et al., 2017), including a larger sample of first-generation students. This served to better represent the target population. In it, we further examined the STEM-specific scale and began to develop a College Student role model availability scale. Finally, Study 4 was a larger undergraduate sample from our home institution.

Method

Ethical Approval

All studies were approved by the University of Wyoming's Human Subjects Institutional Review Board (Protocol #20210902ED03117).

Study 1 Participants

299 undergraduate psychology students at the University of Wyoming completed this study for partial course credit (see Table 2 for demographic information for all studies). They completed it online using Sona software as part of the department-wide pre-screening survey.

Sample size was determined by the number of students who completed the survey during the two weeks it was available (per department policy). There were no exclusions. Based on Mundfrom et al.'s (2005) Monte Carlo simulation study, this sample size provides adequate power to accurately estimate the hypothesized 3-factor solution with only 4 items per factor (assuming high communality, which was justified given the

Table 2. Summary of Demographics From all Studies

	Study			
	1	2	3	4
n	299	182	386	581
First-Generation	31.40%	25.80%	64.80%	13.60%
Continuing-Generation	68.60%	74.20%	35.20%	48.50%
Woman	72.90%	67%	74.90%	44%
Man	25.40%	33%	20.50%	18.10%
Non-Binary	1.70%	-	4.70%	-
Mean Age (SD)	21.86 (5.92)	21.18 (4.62)	23.06 (5.86)	21.16 (4.38)
White	83.90%	82.40%	57.50%	50.60%
Asian	1.70%	1.60%	15.30%	1.20%
Black	0.30%	1.10%	6.50%	0.40%
Hispanic	3.70%	7.70%	14.50%	7.50%
Native American/Hawaiian	0.30%	1.10%	0.80%	-
Multiracial/Multiethnic	10%	6%	5.40%	1.80%
STEM Major	30%	36%	38%	9%
Psychology Major	38%	29%	12%	8%

specific nature of the constructs under consideration). We initially created 8 items per factor, which would increase power.

Study 2 Participants

182 undergraduate students from the University of Wyoming completed this study for partial course credit. They completed it online using Qualtrics software.

Sample size was determined by the number of participants we could recruit in a semester (which was unfortunately lower than desired, due to lower rates of study participation during the COVID-19 pandemic). There were no exclusions. Nonetheless, Mundfrom et al.'s (2005) Monte Carlo simulation study indicated this sample size exceeded the minimum sample size needed to accurately estimate a 3-factor solution, assuming high communality, and at least 5 items per factor. Sensitivity analyses indicated that it provided adequate power to detect an $r = .21$, slightly higher than the average published effect size (e.g., Gignac & Szodorai, 2016).

Study 3 Participants

In Study 3, we sought to recruit a sample of college students extending beyond our home institution. We recruited college students online, using Prolific Academic (Peer et al., 2017). Our sampling goal was to recruit a final sample of 250 First-Generation College Students, as this is the size at which correlations stabilize (Schönbrodt & Perugini, 2013). Beyond this, we also sought to recruit 136 Continuing-Generation Students, as power analyses indicated that this would provide adequate power to detect group mean differences as small as d = .30 in t-tests.

To recruit this sample, we first pre-screened a larger sample of 1,066 Prolific users through a 5-min survey in exchange for a small payment. This larger sample was used in some analyses (as noted below). To be eligible, participants had to verify being currently enrolled in college and residing in the United States. Participants were excluded if they had missing data on the role model questionnaire (71 participants) or failed the 1 attention check question (7 participants). Of these 1,066, 320 were first-generation students.

Participants were invited to complete the main study until we reached our sample size for their respective group (Continuing-Generation = 136; First-Generation = 250). Participants were excluded if they did not complete the survey (17 participants), if their response to the First-Generation status was different than the pre-screen sample (4 participants) and if they failed 2 or more direct attention checks (3 participants). The main study took place roughly 1–2 weeks later, lasted approximately 20 minutes, and participants were paid $2.50 for completion. All data collection took place online using Qualtrics software.

Study 4 Participants

581 undergraduate students from the University of Wyoming completed this study in exchange for partial course credit. Data collection occurred online using the Sona system as part of the department pre-screener. Sample size was determined by the participants who completed the pre-screener while available (per department policy). Participants were excluded if they were missing more than 10% of responses across all measures (116 participants).

General Procedures

After providing informed consent and demographic information, participants completed the measures described below in a random order, with all items also presented in a random order. Table 3 provides an overview of all measures administered in all studies, and the hypotheses they were used to test.

Measures

General Role Model Questionnaire (G-RMQ). An initial pool of general role model items was generated and administered in Study 1 (see Online Resource 1 for all items from all versions of the RMQ). We specifically generated items that could potentially measure each role model function: behavioral (e.g., “There is someone in my life whose behaviors I try to copy and emulate”), inspirational (e.g., “There is someone in my life who makes me want to strive toward something new and better”), and representations of the possible (e.g., “There is someone in my group (e.g., race, religion, gender, etc.) who has shown that more careers are available to me than I used to think were possible.”).

Table 3. An Overview of Measures Administered and the Hypotheses They Were Used to Tested

	Study			
Measures	1	2	3	4
General-RMQ	*H1-H10*	*H1-H10*		
STEM-RMQ		*H1-H10*	*H1-H10*	*H2-H10*
College Student-RMQ			*H1-H10*	*H1-H10*
First-Generation Status	*H2*	*H2*	*H2*	*H2*
Grade Achievement	*H3*	*H3*	*H3*	*H3*
Commitment (Klein et al., 2014)			*H4*	*H4*
Course Enrollment				*H4*
PGI (Tracey, 2002)		*H5,H7,H8*		
Expectancy/Value/Cost (Kosovich et al., 2015)			*H5,H7,H8,H10*	
Internalized Motivation (Sheldon et al., 2017)			*H6*	
Group Identification (Leach et al., 2008; Postmes et al., 2013)		*H9*	*H9*	*H9*
Negative Self-Stereotyping (Markey & Markey, 2009)			*H9*	
Perceived Barriers		*H10*	*H10*	
STEM-Specific Perceived Barriers			*H10*	

Note. H = Hypothesis H. Hypotheses are used to indicate which hypotheses are tested with a given measure in a specific study. RMQ = Role Model Questionnaire. STEM = Science, Technology, Engineering, and Mathematics. PGI = Personal Globe Inventory.

We followed Clark and Watson's (1995) recommendations for writing items. We specifically consulted Morgenroth et al. (2015) and their sources to write non-redundant items that tapped different aspects of the constructs. 24 items were initially generated, 8 per function. Items were developed to generally refer to any role model. Because past research suggests that participants from lower socioeconomic status are more prone to acquiescence bias (i.e., adopting a yay-saying or nay-saying response pattern, regardless of item content; see Rammstedt et al., 2010), we wrote an equal number of normal and reverse-coded items to control for this. Study 1's final G-RMQ was administered in Study 2.

STEM Role Model Questionnaire (STEM-RMQ). In Study 2, we modified our initial 24 items to measure STEM role model availability for each function (e.g., "There is someone in my life whose behaviors I could copy and emulate to pursue a STEM career"). The final STEM-RMQ was administered in Studies 3–4.

College Student Role Model Questionnaire (CS-RMQ). In Study 3 (main study only), we modified our items to assess role model availability for how to be a successful college student (e.g., "There is someone in my life who embodies the behaviors needed to succeed as a college student"). The final CS-RMQ were also administered in Study 4.

First-Generation Status. In all studies, participants were asked: "Have at least one of your parents/guardians earned a college degree?". Participants who answered "no, neither of my parents/guardians earned a college degree" were classified as first-generation, and those who answered "yes, at least one of my parents/guardians earned a college degree" were classified as continuing-generation.

Grade Achievement. To test hypothesized relations between Role Model Availability and Academic Achievement (Hypothesis 3), participants were asked to provide their high school grade point average (GPA; in Studies 1–2) and undergraduate GPA (in Studies 1–4). To measure achievement within STEM courses specifically, Study 2 participants were also asked to report their average Math and Physical Sciences grades, using a continuous GPA-like scale (e.g., 4.0 = all A's, 3.0 = B average, etc.).

Commitment. To test the hypothesized relationship between Role Model Availability and Commitment to Earn a Degree (Hypothesis 4), we asked Study 3 (main study) and Study 4 participants to respond to an adapted version of Klein et al.'s (2014) commitment scale focused on commitment to earn a degree in (1) a STEM-field, and (2) any major. The 4-item measure asks participants to rate their commitment on a 1 (*not at all*) to 5 (*extremely*) response scale.

Course Enrollment. To obtain an objective measure of commitment and academic persistence in Study 4, we obtained course enrollment for the current and subsequent semester (Chen & Carroll, 2005; Darolia et al., 2020). Participants consented to allow us to obtain this information from the registrar. For analyses involving the College Student role model scales, total credit hours were used. For analyses involving the STEM role model scales, STEM course hours were used. Following Darolia et al. (2020), a predetermined list (see Online Resource 2) of courses was designated as STEM, including natural/physical sciences, technology, engineering, and mathematics.

Personal Globe Inventory. To test hypothesized relationships between Role Model Availability and Expectancy/Value (Hypotheses 5, 7, and 8), Study 2 participants completed the Personal Globe Inventory (PGI) – Activities scale (Tracey, 2002). This includes a list of 113 activities (e.g., "Conduct chemical experiments") asked twice, once for how much they like the activity (i.e., Value) and once to assess perceived competence at doing the activity (i.e., Expectancy). We focused on the Science-Liking and Science-Competence subscales of this instrument.

Expectancy, Value, and Cost. To test hypothesized relationships between Role Model Availability and Expectancy/Value/Costs (Hypotheses 5, 7, 8, and 10), Kosovich et al.'s (2015) Expectancy-Value-Cost measure was adapted and administered to Study 3 participants (during the main study only) twice. Once, items were adapted to refer to earning a college degree in general, and, during another administration, items referred to STEM courses. It includes 10 items, and the scale ranges from 1 (*strongly disagree*) to 6 (*strongly agree*).

Internalized Motivation. To test the hypothesized relationship between Inspirational Role Models and Internalized Motivation (Hypothesis 6), Study 3 participants took a subset of Sheldon et al.'s (2017) Relative Autonomy Index including items related to external, negative introjection, identified, and intrinsic regulation which were administered twice. Items were adapted to assess internalized motivation to graduate college with (1) any degree, and (2) a STEM degree. Each 16-item measure had a scale from 1 (*not at all*) to 5 (*extremely*). Following Sheldon et al.'s recommendations, a composite variable was calculated to represent internalization of a goal (i.e., intrinsic + identified – negative introjection – external motivation), such that higher scores indicated greater internalization.

Group-Identification. To test hypothesized relationships between Representations of the Possible and Positive Self-Stereotyping (i.e., Hypothesis 9), Study 2 and Study 4 participants' identification with College Students and the STEM-field was assessed with the multicomponent in-group identification questionnaire (Leach et al., 2008). This questionnaire is a 14-item measure with subscales for 5 components of group-identification, i.e., solidarity, satisfaction, and centrality, individual self-stereotyping and in-group homogeneity. The response scale ranged from 1 (*strongly disagree*) to 7 (*strongly agree*). This measure was administered twice, once with items adapted to refer to the STEM-field as the target group, and once with items adapted to refer to College Students. The analyses focused on the overall composite for each target group.

Study 3 (main study) participants completed Postmes et al.'s (2013) single-item group identification measure adapted to measure identification with being a college student and the STEM-field, using a 1–7 agreement response scale.

Negative Self-Stereotyping. To test hypothesized relationships between Representations of the Possible and Lower Negative Self-Stereotyping (i.e., Hypothesis 9), Markey and Markey's (2009) International Personality Item Pool–Interpersonal Circumplex measure was administered to Study 3 (main study) participants. As First-Generation students are stereotyped as less agentic (Stephens et al., 2012), reporting low agency can be considered one indication of negative self-stereotyping for this group. The 16-item measure has a response scale from 1 (*very inaccurate*) to 5 (*very accurate*).

Perceived Barriers. To test the hypothesized relationship between Representations of the Possible and reductions in Perceived Barriers (Hypothesis 10), we constructed items to measure perceived barriers to general academic success. These items were administered to Study 2 participants, and to Study 3 (main study) participants. Based on past qualitative research (Lightweis, 2014; Raque-Bogdan & Lucas, 2016), we created items to examine several barriers often experienced by First-Generation college students. These barriers include (1) feeling a low sense of preparation for university, (2) lack of familial support, (3) parents' low perception of college leading to financial success, (4) negative stereotyping and discrimination, (5) feeling stressed about finances, and (6) feeling like they do not receive adequate support from their instructors/ university. See Online Resource 3 for more information.

STEM-Specific Perceived Barriers. To test the hypothesized relationship between Representations of the Possible and reductions in Perceived Barriers (Hypothesis 10), Study 3 participants were asked to respond to items indicative of barriers to success in STEM courses. These items were based on past research examining barriers faced by underrepresented groups in STEM-fields (Bellini et al., 2019; Peña-Calvo et al., 2016). The STEM-specific barriers include (1) feeling unprepared to pursue the STEM-field, (2) asking for help with STEM courses, (3) lack of STEM instructor support, (4) familial beliefs of STEM focus, (5) lack of parental involvement in STEM classes, and (6) negative stereotyping and discrimination experienced in STEM. See Online Resource 4 for more information.

Results

Hypothesis 1: Distinguishability of Role Model Functions in Factor Analysis

Hypothesis 1 was that the three role model functions would be distinguishable in factor analyses. This hypothesis was broadly supported in all studies for all RMQ versions.

G-RMQ Exploratory Factor Analysis (Study 1). We began by testing this hypothesis using an Exploratory Factor Analysis (EFA) with the General Role Model items in Study 1. We first inspected indices used to determine the number of factors to be extracted, including Kaiser's (1960) eigenvalue greater than one rule, Velicer's MAP analysis, and parallel analysis (Fabrigar et al., 1999; Goldberg & Velicer, 2006). Due to the initial balanced number of normal and reverse-scored items, responses were ipsatized prior to analysis to remove a methods factor (see Ten Berge, 1999; Paulhus & Vazire, 2007). These analyses were performed in the *psych* package for R (Revelle, 2018). Collectively, these indices suggest that solutions containing between 3 factors (i.e., parallel analysis) and 4 factors (i.e., MAP, Kaiser) may be statistically viable.

We applied an oblique Oblimin rotation to the 3- and 4-factor solutions and examined them for conceptual interpretability and statistical viability. We used an oblique rotation because we expected different types of role model availability to be positively correlated. The initial three-factor solution did not directly confirm hypotheses. The Inspirational model items were split between 2 factors, with 2 items forming a very narrow factor ("There is [someone/no one] in my life who has made me interested in a new career path"). The Behavior model items and Representation of the Possible items largely loaded onto a single factor. The initial 4-factor solution was largely similar, except that the Representation of the Possible and the Behavioral model items largely separated into 2 separate factors, though some Behavioral Model items exhibited cross-loadings. We therefore removed the poorly-performing items. After inspecting several interim solutions, we arrived at the factor solution reported in Table 4. As can be seen

Table 4. Role Model Questionnaire Final Factor Loadings, Study 1–4

Item	General-RMQ (Study 1-2) IM	General-RMQ (Study 1-2) BM	General-RMQ (Study 1-2) RP	STEM-RMQ (Study 2–3) IM	STEM-RMQ (Study 2–3) BM	STEM-RMQ (Study 2–3) RP	College Student-RMQ (Study 3–4) IM	College Student-RMQ (Study 3–4) BM	College Student-RMQ (Study 3–4) RP
IM1	**.71 (.86)**	.05	.10	**.81 (.83)**	−.001	−.09	**.87 (.95)**	.01	−.04
IM2	—	—	—	**.90 (.87)**	−.02	.03	**.51 (.94)**	.22	.21
IM3	**.87 (.87)**	−.09	.01	—	—	—	**.40 (.84)**	.27	.11
IM4	**.56 (.91)**	.17	.07	**.57 (.81)**	.004	−.36	**.73 (.96)**	−.01	.17
IM5r	**−.67 (−.63)**	−.08	.08	**−.41 (−.85)**	.26	.24	**−.71 (−.50)**	−.03	−.01
IM6r	—	—	—	**−.81 (−.83)**	.10	−.04	**−.44 (−.53)**	−.13	−.21
IM7r	**−.56 (−.37)**	.02	.01	—	—	—	—	—	—
IM8r	**−.58 (−.71)**	−.10	−.01	**−.45 (−.81)**	.18	.18	—	—	—
BM1	—	—	—	−.06	**.77 (.82)**	.06	.20	**.75 (.89)**	−.12
BM2	.07	**.60 (.85)**	.15	−.08	**.78 (.83)**	.04	−.11	**.88 (.96)**	.10
BM3	—	—	—	.14	**.95 (.81)**	.002	.04	**.67 (.90)**	.11
BM4	.10	**.83 (.94)**	−.04	−.08	**.63 (.87)**	.22	−.08	**.92 (.96)**	−.002
BM5r	—	—	—	.17	**−.75 (−.80)**	.15	−.19	**−.69 (−.65)**	.07
BM6r	.09	**−.72 (−.75)**	−.08	.10	**−.70 (−.83)**	−.08	−.13	**−.63 (−.65)**	−.05
BM7r	—	—	—	−.03	**−.82 (−.81)**	.01	−.18	**−.54 (−.63)**	−.12
BM8r	−.07	**−.64 (−.77)**	−.12	.16	**−.62 (−.81)**	−.13	.03	**−.75 (−.62)**	−.03
RP1	.07	.21	**.49 (.75)**	.10	.16	**.75 (.77)**	.13	.09	**.67 (.91)**
RP2	.02	.16	**.65 (.79)**	−.19	.25	**.46 (.78)**	**—**	—	—
RP3	.01	.12	**.69 (.88)**	**—**	—	**—**	**—**	—	—
RP4	.06	−.14	**.88 (.82)**	−.04	.02	**.72 (.75)**	−.02	−.02	**.90 (.89)**
RP5r	−.05	−.06	**−.53 (−.52)**	.05	−.01	**−.71 (−.74)**	−.06	−.27	**−.40 (−.58)**
RP6r	−.001	−.15	**−.66 (−.63)**	.22	−.09	**−.58 (−.79)**	**—**	—	—
RP7r	−.02	−.08	**−.68 (−.73)**	.03	−.21	**−.59 (−.76)**	**—**	—	—
RP8r	.03	.06	**−.79 (−.56)**	.08	.10	**−.80 (−.72)**	−.10	−.05	**−.61 (−.56)**

Note. Exploratory factor loadings are provided for each item in each questionnaire. Bold values indicate the items' primary factor loading. Confirmatory factor loading values are provided in parentheses for items' primary factor loading only. A dash indicates the item was dropped from a given questionnaire (e.g., because of cross-loading issues). RMQ = Role Model Questionnaire. STEM = Science, Technology, Engineering, and Mathematics. IM = Inspirational Models. BM = Behavioral Models. RP = Representations of the Possible. r = reverse-scored item.

Table 5. Reliability of the Role Model Questionnaires' Subscales (all Studies)

Scale	Subscale	Study 1	Study 2	Study 3	Study 4
General	BM	.85	.90	-	-
	IM	.82	.85	-	-
	RP	.89	.89	-	-
STEM	BM	-	.78	.96	.94
	IM	-	.70	.94	.93
	RP	-	.67	.93	.91
College Student	BM	-	-	.95	.92
	IM	-	-	.91	.87
	RP	-	-	.84	.82

Note. Values indicate Omega reliabilities. A dash indicates the relevant scale was not administered in that study. BM = Behavioral Models. IM = Inspirational Models. RP = Representations of the Possible. STEM = Science, Technology, Engineering, and Mathematics.

there, all items loaded on the hypothesized factor in the anticipated direction in this solution. We retained items that clearly loaded onto their hypothesized factor with the difference between the primary and secondary loading being greater than 0.10. The resulting scales were internally consistent and unidimensional, as indicated by McDonald's Ω values (Dunn et al., 2014) that exceeded .70 in all studies (see Table 5). The different factors from the General RMQ were significantly positively correlated with one another, but not so strongly as to suggest full equivalence (see Table 6).

G-RMQ Confirmatory Factor Analysis (Study 2). To further test the distinguishability of the role model functions, we conducted a CFA using the G-RMQ in Study 2. This model was estimated in Mplus (version 7) using maximum likelihood estimation and co-variance matrices. In it, three latent factors were estimated. Initial analyses suggested an acquiescence bias issue, which is to be expected with the focal population (see Rammstedt et al., 2010). Positive- and negative-worded items loaded on 2 separate

Table 6. Inter-Factor Correlations for Each Version of the Role Model Questionnaire

		(1)	(2)	(3)
General (Study 1)	Behavioral (1)	–		
	Inspirational (2)	.59**	–	
	Representations of the Possible (3)	.72**	.64**	–
STEM (Study 2)	Behavioral (1)	–		
	Inspirational (2)	.76**	–	
	Representations of the Possible (3)	.74**	.81**	–
College Student (Study 3)	Behavioral (1)	–		
	Inspirational (2)	.78**	–	
	Representations of the Possible (3)	.69**	.67**	–

Note. ** indicates $p \leq .001$. STEM = Science, Technology, Engineering, and Mathematics.

factors, independent of role model function. Following Savalei and Falk's (2014) recommendations, we next added an acquiescence bias factor. All items were forced to load equally in the same direction on this factor, in addition to their primary loading of interest. The CFA provided evidence of close fit ($\chi^2_{132} = 266.224$, $p < .001$; RMSEA = .071, 90% CI [.059, .084]; SRMR = .052; CFI = .934; TLI = .924). Within this model, all loadings were significant in the predicted direction (see Table 4, loadings in parentheses). This indicates that participants can distinguish between the three functions, consistent with MTRM.

STEM-RMQ Exploratory Factor Analysis (Study 2). We followed parallel procedures to explore the factor structure of the STEM-specific role model items in Study 2. Indices suggested that between 2 (Parallel analysis) and 3 (MAP, Kaiser rule) should be retained. Given that it conformed to hypotheses, we next inspected the 3-factor solution. We applied an oblique Oblimin rotation and examined it for conceptual interpretability and statistical viability. Items largely loaded on their hypothesized factor, though 2 exhibited cross-loadings. We dropped these items, as well as one additional item that exhibited cross-loadings in a subsequent solution. The final scale and factor solution is displayed in Table 4. As can be seen there, all items loaded on the hypothesized factor in the anticipated direction. The resulting scales were internally consistent and unidimensional, as indicated by McDonald's Ω values (Dunn et al., 2014) that typically exceeded .70 in all studies (see Table 5).

STEM-RMQ Confirmatory Factor Analysis (Study 3). We next conducted a CFA in the STEM-RMQ data from the full prescreening sample of Study 3. This model was again estimated in Mplus (version 7), using maximum likelihood estimation and covariance matrices. In it, 3 latent factors were estimated, and all retained items were specified as loading on their hypothesized factor alone. Initial analyses suggested no acquiescence bias issue was present, so we proceeded to interpret it (see Savalei & Falk, 2014). This analysis provided evidence of close fit for the 3-factor model ($\chi^2_{186} = 1472.253$, $p <$ .001; RMSEA = .081, 90% CI [.077, .084]; SRMR = .037; CFI = .931; TLI = .922). All items strongly loaded in the hypothesized direction. This 3-factor solution supports the separation of the three STEM functions outlined in the MTRM.

CS-RMQ Exploratory Factor Analysis (Study 3). We followed parallel procedures to explore the factor structure of the College Student role model items in Study 3. Indices suggested that solutions containing 3 (MAP, Kaiser rule) and 4 (Parallel analysis) factors should be retained. Given that it conformed to hypotheses, we next inspected the 3-factor solution. We again applied an oblique Oblimin rotation and examined it for conceptual interpretability and statistical viability. Items largely loaded on their hypothesized factor, though 1 item exhibited a cross-loading. We therefore dropped this item. The final scale and factor solution is displayed in Table 4.

As can be seen there, all items loaded on the hypothesized factor in the anticipated direction. The resulting scales were internally consistent and unidimensional, as indicated by McDonald's Ω values (Dunn et al., 2014) that consistently exceeded .70 in all studies (see Table 5).

CS-RMQ Confirmatory Factor Analysis (Study 4). Finally, we conducted a CFA on the CS-RMQ. This model was again fit in Mplus (version 7) using maximum likelihood estimation and covariance matrices. In it, 3 latent factors were estimated. Initial analysis suggested an acquiescence bias issue was present (see Rammstedt et al., 2010), and we therefore added an acquiescence bias factor to control for this (Savalei & Falk, 2014).

This CFA provided evidence of close fit for the 3-factor model ($\chi^2_{127} = 383.433$, $p < .001$; RMSEA = .058, 90% CI [.052, .065]; SRMR = .034; CFI = .964; TLI = .956). All items loaded strongly in the hypothesized direction. This 3-factor solution supports the separate three functions of role models outlined in the MTRM using the CS-RMQ scales.

Hypothesis 2: First-Generation Status and Role Model Availability

Hypotheses 2 suggests that First-Generation students should report lower academic role model availability (compared to Continuing-Generation students) across all role model functions. This provides a "known groups" test of the validity of this measure (Flake et al., 2017). We expected this to be clearly apparent with both STEM and College Student models, but the General-RMQ admittedly provided a more indirect test of this hypothesis, given that it did not explicitly focus on academics. We conducted independent samples tests across studies and across all versions of the RMQ to test this hypothesis. The results were evaluated according to a Bonferroni-adjusted alpha level of .017.

As can be seen in Table 7, the results broadly supported hypotheses. Across model functions of the STEM-RMQ and CS-RMQ, first-generation students reported significantly lower role model availability. While not significant, the general pattern was mostly present with the G-RMQ as well. It is possible that this is because the G-RMQ does not consistently prompt participants to think of academic role models. Additionally, the group mean differences in Representations of the Possible did not fully reach the Bonferroni-adjusted significance level in Study 3, but it was more generally apparent in other studies.

Hypothesis 3–4: Role Model Availability, Academic Achievement, and Commitment

Hypothesis 3 suggests that each of the three role model functions would be positively correlated with corresponding indices of academic achievement (e.g., the STEM-RMQ would be related to STEM grades). Similarly, Hypothesis 4 suggests that each of the three role model functions would be positively correlated with corresponding measures of commitment (e.g., self-reported commitment, course enrollment). These provide tests of the criterion validity of the RMQ measures (Flake et al., 2017). We conducted simple correlational analyses to test these hypotheses.

Table 7. Differences in Role Model Availability Between First- and Continuing-Generation Students

Study	Role Model	Function	First-Gen *M (SD)*	Cont.-Gen *M (SD)*	*t*	*p*	D
1	General	Inspirational	5.88 (1.09)	5.79 (1.07)	−0.71	0.48	−0.09
		Behavioral	4.95 (1.35)	5.29 (1.29)	2.07+	0.04	0.26
		Rep. of Possible	5.23 (1.27)	5.53 (1.09)	2.06+	0.04	0.26
2	General	Inspirational	5.50 (1.29)	5.84 (0.91)	1.97+	0.05	0.33
		Behavioral	4.65 (1.62)	5.20 (1.28)	2.36+	0.02	0.40
		Rep. of Possible	4.87 (1.40)	5.47 (0.95)	3.26*	0.001	0.55
	STEM	Inspirational	4.07 (1.36)	4.88 (1.34)	3.56*	<0.001	0.61
		Behavioral	4.29 (1.34)	5.11 (1.27)	3.74*	<0.001	0.64
		Rep. of Possible	4.30 (1.27)	4.91 (1.20)	2.92*	0.004	0.50
3	STEM	Inspirational	3.85 (1.67)	4.43 (1.70)	3.23*	0.001	0.34
		Behavioral	4.13 (1.70)	4.98 (1.47)	4.91*	<0.001	0.53
		Rep. of Possible	4.28 (1.57)	4.83 (1.35)	3.45*	0.001	0.38
	College Student	Inspirational	5.23 (1.41)	5.67 (1.09)	3.21*	0.001	0.35
		Behavioral	4.91 (1.50)	5.56 (1.18)	4.32*	<0.001	0.48
		Rep. of Possible	4.89 (1.38)	5.17 (1.27)	1.99+	0.047	0.30
4	STEM	Inspirational	4.16 (1.53)	4.72 (1.42)	3.93*	<0.001	0.38
		Behavioral	4.41 (1.44)	5.04 (1.32)	4.66*	<0.001	0.45
		Rep. of Possible	4.33 (1.32)	4.81 (1.24)	3.84*	<0.001	0.37
	College Student	Inspirational	5.72 (1.04)	6.00 (0.86)	3.11*	0.002	0.29
		Behavioral	5.41 (1.27)	5.97 (0.88)	5.72*	<0.001	0.51
		Rep. of Possible	5.35 (1.20)	5.74 (0.96)	3.84*	<0.001	0.36

Note. * indicates significance according to a Bonferroni-adjusted alpha ($p \leq .017$). + indicates $p \leq .05$. Gen = Generation. Cont. = Continuing. Rep. of Possible = Representation of the Possible. STEM = Science, Technology, Engineering, and Mathematics.

The results are summarized in Table 8. As can be seen there, results were consistent with hypotheses. Each of the STEM-RMQ role model functions were positively correlated with science grades, Math grades, Commitment to Earn a STEM Degree, and STEM Course Enrollment. Similarly, the CS-RMQ functions were typically correlated with College GPA and Commitment to Earn a college Degree (with occasional marginal correlations). This result was less robust with the G-RMQ, which is again likely due to the lack of an explicit focus on academic role models. Additionally, this result was less robust with total course enrollment credits, which is likely driven more by being a full- or part-time student.

Hypotheses 5–6: Associations of the Inspirational Models Scale

Hypotheses 5-6 both concerned the associations of the Inspirational Role Models scale. More specifically, Hypothesis 5 suggests that Inspirational Models will be most strongly positively related to the perceived Value of achieving a corresponding goal

Table 8. Relationship Between Role Model Availability and Academic Engagement

Study	Role Model	Outcome	Inspirational *r*	Behavioral *r*	Rep. of Possible *r*
1	General	High School GPA	.11+	.15*	.14*
	General	College GPA	.12*	.14*	.12*
2	General	High School GPA	.06	.09	.15*
	General	College GPA	−.01	−.03	.01
	STEM	Math Grades	.30*	.21*	.26*
	STEM	Physical Science Grades	.26*	.20*	.23*
3 (Full)	College Student	College GPA	.20*	.18*	.13*
	College Student	Commitment to Any Degree	.36*	.26*	.24*
	STEM	Commitment to a STEM Degree	.51*	.27*	.27*
3 (First-Gen)	College Student	College GPA	.20*	.15*	.11+
	College Student	Commitment to Any Degree	.32*	.18*	.21*
	STEM	Commitment to a STEM Degree	.46*	.25*	.25*
4	College Student	College GPA	.16*	.11*	.09+
	College Student	Commitment to Any Degree	.29*	.21*	.22*
	College Student	Current Semester Total Credits	.06	.01	.02
	College Student	Next Semester Total Credits	.16*	.12*	.17*
	STEM	Commitment to a STEM Degree	.62*	.45*	.47*
	STEM	Current Semester STEM Credits	.25*	.26*	.20*
	STEM	Next Semester STEM Credits	.22*	.16*	.12

Notes. * indicates $p < .05$. + indicates $p < .10$. Rep. of Possible = Representation of the Possible. STEM = Science, Technology, Engineering, and Mathematics. Gen = Generation.

(e.g., earn a STEM or any College degree). Hypothesis 6 suggests Inspirational Models will be most strongly positively related to Internalized Motivation to achieve a corresponding goal. The MTRM suggests that Inspirational models should be more strongly related to each relevant outcome, compared to other model functions. As such, we calculated zero-order correlations, and statistically compared the size of these correlations to test these hypotheses. This provides a test of the convergent and discriminant validity of the RMQ (Flake et al., 2017).

Table 9. Relationships Between Role Model Availability and Value/Competence

Study	Role Model	Outcome	Inspirational *r*	Behavioral *r*	Rep. of Possible *r*
Perceived Value					
2	STEM	PGI Science-Liking	.26*[a]	.10[b]	.16*
3 (Full)	STEM	STEM Value	.46*[a]	.31*[b]	.30*[b]
	College Student	College Degree Value	.41*[a]	.28*[b]	.28*[b]
	STEM	STEM Internalized Motivation	.33*[a]	.22*[b]	.20*[b]
	College Student	College Internalized Motivation	.28*[a]	.17*[b]	.13*[b]
3 (First-Gen)	STEM	STEM Value	.44*[a]	.31*[b]	.30*[b]
	College Student	College Degree Value	.36*[a]	.21*[b]	.23*[b]
	STEM	STEM Internalized Motivation	.36*[a]	.28*[b]	.23*[b]
	College Student	College Internalized Motivation	.33*[a]	.20*[b]	.22*[b]
Perceived Competence					
2	STEM	PGI Science-Competence	.32*[a]	.14+[b]	.21*[b]
3 (Full)	STEM	STEM Expectancy	.44*[a]	.37*[b]	.33*[b]
	College Student	College Degree Expectancy	.38*[a]	.29*[b]	.26*[b]
3 (First-Gen)	STEM	STEM Expectancy	.42*[a]	.34*[b]	.31*[b]
	College Student	College Degree Expectancy	.35*[a]	.25*[b]	.27*

Notes. * indicates $p < .05$. + indicates $p < .10$. Correlation sizes were statistically compared between the different role model types. Subscript *a* indicates the strongest correlation observed. Subscript *b* indicates a correlation that was significantly different from *a*. Rep. of Possible = Representation of the Possible. STEM = Science, Technology, Engineering, and Mathematics. PGI = Personal Globe Inventory. Gen = Generation.

Table 9 summarizes the results of these analyses. As can be seen there, the results were quite consistent with hypotheses. Inspirational role model availability consistently exhibited a significant correlation with measures of perceived Value and Internalized Motivation. Moreover, this correlation was typically stronger than the correlations involving Behavioral models and Representations of the Possible.

Hypotheses 7–8: Behavioral Models, Representations of the Possible, and Expectancy

Hypotheses 7–8 focus on the associations of the Behavioral models and Representations of the Possible scales. More specifically, Hypothesis 7 suggests that Behavioral Models will exhibit a stronger positive correlation with the perceived Expectancy of achieving a goal (e.g., earn a STEM/College degree), compared to Inspirational Models. Hypothesis

8 suggests that Representations of the Possible will also exhibit a stronger positive correlation with the perceived Expectancy of achieving a corresponding goal (e.g., earn a STEM/College Degree), compared to Inspirational Models. In both cases, the MTRM suggests that these two scales should be more strongly related to Expectancy, relative to Inspirational models. As such, we again calculated zero-order correlations, and statistically compared the size of these correlations to test these hypotheses.

Table 9 summarizes the results of these analyses. As can be seen there, the results only partially supported hypotheses. The availability of Behavioral models and Representations of the Possible were typically significantly related to Expectancy of Success (with the sole exception of STEM Behavioral models & Science Competency in Study 2). Nonetheless, Inspirational role model availability was unexpectedly more *strongly* correlated with Expectancy, and this difference in the magnitude of correlations was often significant.

Hypotheses 9–10: Representations of the Possible, Self-Stereotyping, and Perceived Barriers

Hypotheses 9-10 both focus on the associations of the Representations of the Possible scale. More specifically, Hypothesis 9 suggests that Representations of the Possible will be positively related to Positive Self-Stereotyping (i.e., perceived similarity to the average member of the aspirational group; e.g., STEM professionals) and inversely related to Negative Self-Stereotyping (i.e., ascribing negative ingroup stereotypes to one's self; e.g., low agency). Hypothesis 10 suggests that Representations of the Possible will be inversely related to Perceived Barriers to goal achievement. In both cases, the MTRM suggests that Representations of the Possible should be more strongly related to these outcomes, relative to other role model functions. As such, we again calculated zero-order correlations, and statistically compared the size of these correlations to test these hypotheses.

Table 10 summarizes the results of these analyses. As can be seen there, the results only partially supported hypotheses. At the zero-order level, Representations of the Possible were significantly related to greater Positive Self-Stereotyping (i.e., perceived similarity to the average aspirational group member) and perceptions of fewer Barriers. However, these correlations were often weaker than or equivalent to the correlations involving other role model functions.

Exploratory Interaction Analyses

It is possible that Inspirational role models help to create Expectancies of Success, reduce Perceived Barriers, and facilitate Identification with the Aspirational Group by motivating students (e.g., to develop relevant skills, face potential barriers head-on, etc.). By contrast, Behavioral models and Representations of the Possible may only be useful in these regards if a person has an Inspirational role model available, or if they are otherwise motivated to pursue the relevant goal. If a person sees little value in the goal to begin with, the presence of skilled individuals or individuals like oneself may be

Table 10. Relationship Between Role Model Availability and Group Identification/Barriers

Study	Role Model	Outcome	Inspirational r	Behavioral r	Rep. of Possible r
2	General	College Student Identification	.34*[b]	.41*	.45*[a]
	STEM	STEM Identification	.45*[a]	.23*	.31*[b]
	General	Perceived Barriers	−.37*[a]	.005	.005
3 (Full)	College Student	College Student Identification	.20*[a]	.16*	.13*
	STEM	STEM Field Identification	.47*[a]	.27*	.26*[b]
	College Student	Agency	.13*[a]	.10+	.06
	STEM	Agency	.14*[a]	.07	.07
	College Student	Perceived Barriers	−.37*	−.40*[a]	−.22*[b]
	STEM	STEM Perceived Barriers	−.44*	−.46*[a]	−.35*[b]
	College Student	Cost	−.34*[a]	−.32*	−.01
	STEM	Cost	−.27*[a]	−.26*	−.19*[b]
3 (First-Gen)	College Student	College Student Identification	.19*[a]	.16*	.16*
	STEM	STEM Field Identification	.46*[a]	.31*	.27*[b]
	College Student	Agency	.15*[a]	.10	.08
	STEM	Agency	.13*[a]	.02	.04[b]
	College Student	Perceived Barriers	−.36*[a]	.03	−.22*[b]
	STEM	STEM Perceived Barriers	−.42*	−.42*[a]	−.32*[b]
	College Student	Cost	−.32*[a]	.003	−.20*[b]
	STEM	Cost	−.27*[a]	−.25*	−.18*[b]
4	College Student	College Student Identification	.37*	.32*[b]	.40*[a]
	STEM	STEM-Field Identification	.60*[a]	.47*	.51*[b]

Notes. * indicates $p < .05$. + indicates $p < .10$. r indicates the zero-order correlation. Correlation sizes were statistically compared between the different role model types. Subscript *a* indicates the strongest correlation observed. Subscript *b* indicates a correlation that was significantly different from *a*. Rep. of Possible = Representation of the Possible. STEM = Science, Technology, Engineering, and Mathematics. Gen = Generation. Cont. = Continuing.

irrelevant. To examine this possibility, we conducted exploratory regression analyses examining possible interaction effects. As these analyses were not planned *a priori*, any results with them should be treated with caution. Nonetheless, we report several illustrative interactions as they help to explain the unexpected results reported above (see

Table 11. Illustrative Findings From Exploratory Regression Analyses Examining the Moderating Effect of Inspirational Role Models, Study 3

Outcome (Y)	Predictor (X)	Interaction Effect (*b*)	Simple Slope of X at Low Insp. (*b*)	Simple Slope of X at High Insp. (*b*)
College Degree Expectancy	CS-Behavioral	.07*	−.07	.11*
College Degree Expectancy	CS-Rep. of Possible	.04*	−.05	.06
Positive Self-Stereotyping with College Students	CS-Rep. of Possible	.10*	−.01	.26*
Perceived Barriers	CS-Behavioral	−.03*	−.11*	−.19*
STEM Perceived Barriers	STEM-Behavioral	−.03*	−.09*	−.20*
Costs (Any College Degree)	CS-Behavioral	−.08*	−.01	−.23*
Costs (STEM Degree)	STEM-Behavioral	−.05*	−.04	−.23*

Notes. * indicates $p < .05$. Insp. = Inspirational Models. CS - College Student. Rep. of Possible = Representation of the Possible. STEM = Science, Technology, Engineering, and Mathematics.

Online Resource 5 for all interaction analyses). The analyses are run on the full sample Study 3 data as it was the largest sample collected.

Table 11 summarizes the results of several illustrative interactions. The third column indicates that several interactions between Inspirational role model availability and the corresponding predictor (x) variable were significant, when predicting outcomes of substantive interest for the predictor (x) variables. In all these cases, Behavioral role model availability or Representation of the Possible availability was more strongly related to a beneficial outcome (e.g., greater expectancy of success, perception of fewer barriers) at high levels of Inspirational role model availability. Again, caution should be used in interpreting these exploratory results, and replication is needed before firmer conclusions can be drawn. Nonetheless, they suggest that Behavioral role model availability and Representation of the Possible availability may be more reliably beneficial when Inspirational role models are also available.

General Discussion

The Motivational Theory of Role Modelling suggests that three functions of role models can be distinguished: inspirational role models, behavioral role models, and representations of the possible (Morgenroth et al., 2015). However, prior research testing this theory (e.g., Chen et al., 2024; Gartzia et al., 2021) has relied on ad-hoc measures of role model availability, which do not distinguish between these three functions. While this practice is understandable in the absence of validated measures, it nonetheless introduces ambiguity and researcher degrees of freedom into the research process, posing a significant obstacle to scientific progress (Flake & Fried, 2020). We therefore sought to develop and validate a measure which distinguishes between these three role model functions. We found that this measure exhibits a factor structure consistent with MTRM's predictions, such that the three proposed role model functions can be distinguished in factor analyses. Furthermore, its subscales are internally reliable, and first-generation college students report lower availability of all role model functions. All role model functions are related to relevant consequential outcomes, such as grades, academic commitment, and course enrollment. Support for more nuanced predictions from this theory was mixed, however, with hypothesized associations for the inspirational models scale being most clearly supported. Inspirational models appeared to indirectly contribute to benefits theorized to result from other functions, possibly because inspiration is a precondition to those benefits. We discuss each of these findings and their theoretical implications in more detail below.

Factor Structure of Role Model Functions

We first hypothesized that the three functions of role models outlined in the MTRM (Morgenroth et al., 2015) would form distinguishable factors in factor analyses. Across several studies and role models for different goals (i.e., demonstrating how to succeed Generally, in a STEM-field, and as a College Student), there was support for the distinguishability of Inspirational, Behavioral, and Representations of the Possible role model functions. This result validates one critical aspect of the MTRM that has yet to be directly examined. The factor structure of role model availability items supports a distinction between these three types of role models.

First-Generation Status and Role Model Availability

We next hypothesized that First-Generation students should report lower academic role model availability compared to Continuing-Generation students, especially for academically-relevant goals (i.e., STEM and being a College Student). Past research clearly establishes that First-Generation students have fewer academic role models available to them, as they lack a parent who could serve this role for collegiate studies (Stephens et al., 2012, 2014; Trenor et al., 2008). Thus, this provides a "known groups" test of the validity of this measure (Flake et al., 2017). There was support for this hypothesis across the three role model functions for STEM-related and College Student-related role models. Broadly, these results suggest that First-Generation students perceive fewer academic role models than Continuing-Generation students.

Role Model Availability, Academic Achievement, and Commitment

We next hypothesized that the three functions of role models would be positively correlated with relevant consequential outcomes - namely academic achievement and commitment. While past research suggests that the availability of academic role models is broadly related to academic success and persistence (e.g., Chen et al., 2024; Gartzia et al., 2021; Griffin et al., 2010), it is currently unclear if this generalizes to all three role model functions. This association was found to be significant for all academically-relevant role model functions, including Inspirational Models, Behavioral Models, and Representations of the Possible. This provides evidence of criterion validity (Flake et al., 2017) for these scales and suggests all three types of role models may be beneficial for improving academic performance and persistence. The main exception to this pattern was the General Role Model Questionnaire, which may have not consistently prompted participants to think of academic role models. This suggests that researchers should closely align their measure of role model availability with the target goal in future research (see Ajzen & Fishbein, 1977).

Construct Validity of the Inspirational Models Scale

We next examined the construct validity of the Inspirational Role Model scale (Flake et al., 2017). Based on MTRM (Morgenroth et al., 2015), we hypothesized that Inspirational Models should be more strongly related to perceived Value and Internalized Motivation, relative to the other role model functions. While past research certainly suggests that thinking about role models increases internalized motivation (e.g., O'Brien et al., 2017), this research does not directly compare the different role model functions. Across multiple analyses, results supported these hypotheses. The availability of inspirational role models was significantly related to both valuing a corresponding goal and finding the pursuit of it intrinsically enjoyable. Moreover, these associations were stronger than associations with Behavioral Role Models or Representations of the Possible. Inspirational role models may indeed be the most effective route to increasing the value and intrinsic desire for academic success. Future research should conduct more detailed analyses to parse apart the different proposed pathways by which inspirational role models are thought to increase value, such as identification, internalization, and admiration (see Morgenroth et al., 2015).

Construct Validity of the Behavioral Models and Representations of the Possible Scales

We next examined the construct validity (Flake et al., 2017) of the Behavioral Models and Representations of the Possible Model scales. Based on MTRM (Morgenroth et al., 2015), we hypothesized that both scales should be strongly related to Expectancy of success at achieving a relevant goal, and more strongly related to Expectancy than Inspirational Models. Based on MTRM, we further hypothesized that Representations of the Possible would be most strongly related to more positive (and less negative) Self-Stereotyping and to reduced Perceived Barriers. While past research certainly suggests that role models (especially from one's ingroup) are effective in these fashions (BarNir et al., 2011; Gartzia et al., 2021; Rudman & Phelan, 2010; Stout et al., 2011), they have not directly contrasted measures of the different role model functions.

These hypotheses were only partially supported. The availability of Behavioral Models and Representations of the Possible were often significantly and positively related to these hypothesized constructs However, these correlations were often weaker than, or statistically equivalent to, the correlations involving Inspirational role model functions. These results provide only partial support for MTRM. While they suggest that increasing the availability of Behavioral Models and Representations of the Possible may be one effective route to increasing Expectancies of success (for example), they also suggest that increasing the availability of Inspirational Models may be equally or more effective in this regard.

Given these unexpected results, we speculated that Behavioral Models and Representations of the Possible may be most useful (e.g., in increasing the Expectancy of success) if Inspirational Models are also present. If a person is not first inspired to pursue a goal, they may be unmotivated to make use of vicarious learning opportunities to hone their skills, or to closely observe successful ingroup members for information on how to navigate group-specific barriers. If an Inspirational Model is present, however, they may become motivated to do so.

We conducted a series of exploratory moderation analyses to test this speculation, and they largely provided support for it. For example, the availability of Behavioral Models for College Success was only related to greater Expectancy of obtaining a college Degree when Inspirational Models were also highly available. Caution should of course be used in interpreting these results, given that these analyses were not planned a priori. Nonetheless, they suggest that Behavioral Models and Representations of the Possible may only exhibit their purported benefits (e.g., increasing expectancy) when Inspirational Models are also available and when the individual is already strongly motivated to achieve a goal. Future research using specialized samples that already have an intrinsic value of a goal (e.g., dedicated STEM majors) could be beneficial to examine the differential predictive associations of Behavioral and Representations of the Possible model availability.

Limitations and Future Research

While the current studies were useful in developing and validating a measure that separately assessed three theorized functions of role models, several limitations of them should nonetheless be noted. Though the sample sizes met the minimum requirements based on Mundfrom et al.'s (2005) power analyses, they nonetheless may be considered small by some other standards (e.g., Study 1 and 2's sample sizes fall below Clark & Watson's, 2019, recommendation of a sample size of 300). However, the replication of many results with larger sample sizes in Studies 3 and 4 (especially the Study 3 prescreening sample of 1,066) suggests that results remain robust with larger samples.

Another limitation of the current studies is the lack of evidence for causality. The primary purpose of the present studies was to develop a validated instrument which can separately assess three theorized functions of role models. The cross-sectional correlational studies that are necessary to do this seldom provide evidence of causality. Nonetheless, these studies can usefully inform future experimental research which seeks to provide evidence of causality. For example, these scales can be used to validate if experimental manipulations selectively alter the availability of only one role model function or diffusely alter the availability of multiple functions. Given the unexpected findings (e.g., regarding Expectancy) noted above, this could be especially useful. For example, our exploratory analyses suggest that role models who serve the function of both Inspirational and Behavioral models may be more useful in increasing an aspirant's Expectancy of success than a role model who only serves the Behavioral Model function alone.

Finally, the current studies were solely focused on how role model availability is useful in facilitating academic motivation in the American collegiate context alone. Future research should examine if this scale is useful in the context of other academic settings (e.g., primary or secondary schools), other goals (e.g., goals for occupational success, satisfying relationships, physical health, or personal improvement), or in other cultures entirely. Role modeling and social learning are often thought to be a fundamental feature of human nature (e.g., Herrmann et al., 2007). Thus, many characteristics of role modelling may apply broadly to many goals in many cultural settings. Nonetheless, it would be shortsighted to expect there to be no variation across goals or settings. For example, in many (e.g., less industrialized) cultures, collegiate education is relatively rare. In small scale societies, even formalized education itself is rare (e.g., Csibra & Gergely, 2011). In such settings, the vast majority of individuals may occupy a status quite comparable to First-Generation college students, and it would of course be fascinating to examinate how role model availability facilitates motivation and achievement in such settings.

Conclusion

The present studies broadly supported many claims made by the MTRM (Morgenroth et al., 2015). The strongest support is for the distinguishability of three role model functions, their lower availability for underrepresented groups (i.e., First-Generation college students), their relevance to predicting important academic outcomes, and the associations of Inspirational role models. With only varying support for Behavioral and Representations of the Possible Models' associations, future research replicating and exploring the potential benefits of these types of models in the presence of Inspirational role models would be beneficial. Broadly, the results support the continued relevance of the MTRM for future role model research to explore.

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Ethical Considerations

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