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EFFECTS OF ATTAINABILITY AND SIMILARITY OF FEMALE ROLE MODELS ON FEMALE UNIVERSITY STUDENTS:

An experimental study in the fields of Natural science and Humanities

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PREFACE

Before you lies the master thesis “Effects of attainability and similarity of female role models on female university students: An experimental study in the fields of natural science and humanities” in which female role models are investigated in an academic setting. This thesis has been written to fulfil the requirements of the Communication Science master Program at the University of Twente.

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“All oppression creates a state of war” – Simone de Beauvoir

Helen Harmsen

ABSTRACT

Women are underrepresented in high positions, this is not any different in the academic world. Previous research shows that women do not lack the ambition to become professors but they do feel like they do not belong in that position. Role models can be the key in supporting and motivating underrepresented women to pursue a career that, stereotypical, does not fit with being a woman. This study contributes to existing literature by taking a closer look at responses of students from two fields of study towards female role models from these fields.

In this research, two fields of study play an important part namely: humanities and natural science. Each field of study has its own characteristics and culture. In the natural science hard work, brilliance and objectivity are highly valued whereas the humanities are more focused on social skills, and excellence is more debatable. With this in mind, it is expected that effective role models will differ per field of study. Two key features investigated in this research are the level of similarity and the level of attainability of the role model. For the factor similarity, this study investigates whether a role model needs to be active in the same field of study as the student or that being a female academic is similar enough. For attainability, the progression of the role model is investigated. Two levels of academic progression, a PhD student and a professor, are presented to see if, and on what level, academic success is perceived as attainable.

In this experiment using an online questionnaire a 2 (PhD student, professor) x 2 (natural science/ humanities) design was used. In total, 210 students from natural science (n= 119) and humanities (n= 91) participated by reading a profile of a role model and filling in a questionnaire. In total four profiles (PhD student from natural science, PhD student from humanities, professor from natural science, and a professor from humanities) have been randomly presented. Each profile was identical expect for the field of study of the role model and her position (PhD or Professor). The level of her achievements, elaborated in the profile, fitted with her field and her position.

Contradictory to the set hypotheses, the professor profile had a significant positive effect on the perceived identity compatibility and sense of belonging of the respondent compared to the PhD profile. The field of study of the profile did not show any significant differences. It is therefore assumed that similarity by means of field of study is not important. When at least the gender and the educational institution is similar to that of the student, similarity in field of study is not necessary for positive effects. As for the field of study of the student, only significant differences were found among humanities students. The fitted PhD condition scored significantly lower than the other three profiles.

The findings indicate that professor role models from a wide variety of studies can be used to increase the factors perceived identity compatibility and sense of belonging. Even though these results do not indicate a direct increase in the number of female professors these results are hopeful. Sense of belonging and perceived identity compatibility are believed to have a positive effects on women's engagement and retention in their field, and their self-confidence which ultimately can lead to an increase of female professors.

Keywords: Role model in science, female Professor, Fields of study, Similarity, Attainability

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1. Introduction

Matilda is a little girl who loves science and inventing. Her heroes are Marie Curie, Leonardo da Vinci and Thomas Edison, and one day she wants to be a famous inventor herself. So, when she doesn't win the school science fair, she's devastated – especially as the judges didn't believe she'd come up with her entry on her own. Because she's a girl (Irving, 2017).

This fictive children's book story by Ellie Irving (2017) is unfortunately partly true. The girl's name 'Matilda' refers to the 'Matilda effect': a bias against acknowledging the achievements of female scientists. Already in 1870, Matilda Joslyn Gage introduced the term. Equality has come a long way but still, women's capabilities are still not always acknowledged. Women continue to face gender-related challenges in science (Blackmore, 2014; Fritsch, 2015; Rafnsdóttir & Heijstra, 2011). For example, in the recruitment process of a professor, female candidates are expected to excel in each qualification. Men receive the benefit of the doubt. Not excelling in a qualification is less of a problem and more seen as an opportunity for growth (Van den Brink & Benschop, 2011). More research is needed to contribute to the understanding of factors and mechanisms that can buffer women from these experiences and contribute to their persistence in science (Rosenthal, Levy, London, Lobel & Bazile, 2013).

1.1 Women in science, the numbers

In Dutch university education, women form the majority at bachelor and master levels. However, moving onwards from the PhD candidates they gradually become a bigger minority as the education level increases. This effect, of women dropping out when moving up the career ladder, is called the Leaky Pipeline effect (Berger, 2018; UNESCO, 2018). The higher the position the fewer women are still present. From 43% for PhD candidates to 39,3% assistant professors, 27,5% associate professors and only 19,3% of the professors are female. According to numbers by UNESCO, the Netherlands stands last in percentages of female full professors in Europe (UNESCO, 2018). In 2016 the number of female professors in the Netherlands grew with a record-breaking 1,2%. The biggest growth in a decade. With this speed, it will still take until 2051 to get to a gender balance (LNVH, 2017). While more women than men are enrolling in university, relatively few pursue a career in science. This gender gap is very undesirable, since diversity can benefit creativity, group productivity and performance (Ellemers & Rink, 2016). Research has shown that the leaks in the pipeline, women dropping out, are often caused by stereotypes and bias (UNESCO, 2018).

1.2 Stereotypes

Stereotypes are learned early in life before people have the ability to question them (Rudman & Phelan, 2010). By the time children go to school for the first time, they have learned to categorize themselves and others as male or female. People around them contribute to how children understand what is expected of their gender and shape how they think of their place in the social structure (McCabe, Fairchild, Grauerholz, Pescosolido & Tope, 2011). And even though traditional beliefs are now widely disapproved of, implicit gender stereotypes automatically associate men and women with certain abilities and roles (Rudman & Phelan, 2010). These stereotypes have a negative effect on women's performance in for example an analysis of publications in a biology journal, the acceptance rate for female first-author manuscripts increased when the journal switched from

single- to double blind review. In another study, women needed to be 2.5 times more productive than men to receive the same peer review scores for postdoctoral fellowships in biomedical research (Carli et al., 2016). Furthermore, negative stereotypes concerning women's intellectual abilities also have a negative effect on their sense of belonging in STEM fields (Science, Technology, Engineering, and Math) (Lewis, Stout, Pollock, Finkelstein, & Ito, 2016).

1.3 Differences between men and women

Although there are few actual differences between men and women, people believe that such differences exist. They believe men possess more agentic characteristics than women do, and women possess more communal characteristics. Men are more analytical, competitive and independent whereas women are considered to be kinder, warmer and more understanding and helpful (Carli et al., 2016). Through these stereotypes there are perceptions about jobs that fit or do not fit with a certain gender. In a study by Rice and Barth (2016), typical masculine and feminine positions were presented and respondents selected the most suitable applicant for the job. The applicants whose gender was congruent with the job's characteristics were selected, confirming findings by Cobert and Hill (2015; Rice & Barth, 2016).

Even though studies show that there are actual few gender differences in leadership style and effectiveness, other than a slight advantage in women's leadership being somewhat more transformational than men's, both men and women are capable of the same (Hoyt & Simon, 2011). But because of these traditional gender stereotypes, men are still rewarded greater access to power and resources. This results in a incongruence in leadership: men are rewarded for their leadership abilities, while women with the exact same abilities are often punished. Women are supposed to avoid men-like behaviour, like taking charge and giving directions. By leading 'feminine' they found a way to be a leader but these women do little to lift the status of women as a group. 'Masculine' women attain leadership positions but at the same time, they confirm the stereotype of other women being too 'feminine' to do the job resulting in a vicious circle (Rudman & Phelan, 2012).

1.4 The lack of women in science

Masculine traits are not only appreciated in leadership positions. Just like women are less likely to be associated with leadership they are also not associated with science (Carli et al., 2016; Latu, Mast, Lammers, and Bombari, 2013). Research by Need, Visser and Fischer (2001) on differences among PhD students, shows that there are also actually few differences between male and female PhD's. There is no difference in effort and only a little in ambition to become a professor. The biggest difference is in expectations: women tend to see the future a little less bright even when they have the same ambitions as men. The expectation to realize their ambitions, and to actually become a professor is lower for women than for men (Ellemers, Heuvel, Gilder, Maass & Bonvini, 2004; Need et al., 2001; Van den Brink, 2010). The imbalance in the gender of scientists is not caused by a lack of interest in academia. A more important reason for women to stay away from science is because the general thought is that women do not belong there. Research using the Implicit Association Test (Carli, Alawa, Lee, Zhao & Kim, 2016; Greenwald, McGhee, & Schwartz, 1998) indicates that people implicitly associate science more with men than with women. In the study by Carli and colleagues (2016), participants were asked to describe one of seven randomly assigned personas. Results

demonstrate that women are perceived to lack the qualities needed to be successful scientists, which may contribute to discrimination and prejudice against female scientists (Carli et al., 2016).

The belief, in a department or field, that men naturally possess the 'brilliance' needed to become successful scientists is a strong predictor of the representation of women in that field. The 'natural giftedness' in science needs a downplay and instead sustained effort for top level success needs to be highlighted (Leslie, Cimpian, Meyer & Freeland, 2015). Right now, talent is left behind when women are staying at home or get stuck in lower regions of the workforce by (unconscious) gender discrimination (Ellemers et al., 2004). Diversity, not limited to gender, can benefit group productivity and creativity. Employee diversity is therefore related to a more innovative performance, particularly on complex tasks (Ellemers & Rink, 2016).

1.5 This study

To better understand the crucial ingredients or mechanisms involved in women's persistence in science, this study examined two factors drawn from several lines of research and theory that are potentially key variables of successful role models contributing to undergraduate women's sustained interest in pursuing a career in science. We investigate the similarity of the field of study and the attainability of role models. How similar does a role model need to be? Is a woman in science sufficient or does she need to be active in the same field of study? In the factor of attainability, we investigate the question whether role models should be further progressed (being a professor) or less progressed and therefore more attainable (being a PhD student).

A way to counteract the negative effects of stereotypes is exposing women to other successful women (Latu et al., 2013). Stereotypes not only influence how others perceive the group but also how the stereotyped individual perceives herself. Stereotypes influence self-perceptions. Changing these self-beliefs requires both high quality and frequent exposure to counter stereotypic individuals (Asgari, Dasgupta & Gilbert., 2010). These counter-typical examples, or role models, can help to disprove the stereotype by increasing feelings of belonging, perceived identity compatibility, and self-efficacy (Latu et al., 2013).

Sense of belonging is a strong predictor for retention. Women in STEM fields who reported lower feelings of belonging were more likely to switch their major to a non-STEM field at some point, whereas men are less affected by these feelings. When women start to question their position, feel threatened by a lack of other women and are surrounded by negative stereotypes they start to look for a way out (Lewis et al., 2016).

Perceived identity compatibility is another predictor for retention. People develop multiple social identities depending on groups they connect with (e.g. identities related to career, gender, race). The social context (environment people are located in) evoke thoughts, goals, and behaviour consistent with these social identities. For women, stereotypes in academic context communicate an incompatibility between being a woman and being in a STEM field. This poses a threat to the engagement and success of these women in 'masculine' fields. When women's perceived identity is compatible with their field of interest it is more likely they will pursue a career in that field (London et al., 2011).

Besides believing that you fit in, you also need to believe that you can be successful. Self-efficacy is defined as the belief in one's own capabilities to be successful. People who report a high level of self-efficacy are more persistent and it has an influence on the choices people make. They will engage in tasks in which they feel competent and confident and avoid those in which they do not feel that way (Bandura, 1984; Pajares, 1996).

The PhD research of van den Brink (2010) focused on identifying, selecting, and appointing female professors at Dutch universities, whereas Van Norel (2013) investigated the differences between female full professors among research areas in the Netherlands. This research focuses on which role model can have an inspiring effect on female students. This research is believed to be the first to examine not-famous role models from two fields of study in relation to students from these two fields. In contrast to previous research that examined famous leaders as role models or students and role models from only one specific field or not matching fields (e.g. psychology students and math tutors as role models) (Asgari, Dasgupta & Stout, 2011; Cheryan, Drury & Vichayapai, 2012; Hoyt, 2012; Marx & Roman, 2002; Parks-Stamm, Heilman & Hearns, 2007; Rudman & Phelan, 2010; Stout, Dasgupta, Hunsinger & McManus, 2011).

The main research question of the current study is:

To what extent have the similarity and attainability of female role models, an effect on female students' perceived identity compatibility, sense of belonging and self-efficacy?

In the following, a theoretical framework aims to further explain the properties of a role model in science and its effect on perceived identity compatibility, sense of belonging and self-efficacy. Further, the research method and instrument will be described, and the results of the study will be presented. This will be followed by a discussion and conclusion of the research findings. This thesis closes with the study's limitations and suggestions for further research.

2. Theoretical Framework

This chapter contains the theoretical framework on which the study is based. After an introduction of role models, perceived identity compatibility, sense of belonging and self-efficacy will be discussed. These three variables affect the likeliness of women staying in science. Role models have shown that they can have a positive effect on these dependent variables when they are similar and attainable. However, expected is that there is a difference among students in different fields and therefore in the way they can be inspired to pursue a career in science.

2.1 Role models

Role models, people who are an example of success and achievement in a certain field, can be the key in supporting and motivating underrepresented people. They act as a real-life example of what is possible even though what they are doing may not be the norm (Rosenthal et al., 2013). Gibson (2004) gives the following psychological definition of role models: "A cognitive construct based on the attributes of people in social roles an individual perceives to be similar to him or herself to some extent and desires to increase perceived similarity by emulating those attributes" (Gibson, 2004, p.136).

Research agrees on the fact that people can be inspired by imagining having similar qualities as their role models in the future. Yet, a role model can only change self-concepts when people feel psychologically connected. This can be by means of similar interests or attainable achievements (Asgari et al., 2010; Hoyt, 2013).

A role model is not a mentor. These two can be distinguished by their level of interaction. Mentors provide advice and support and have an interactive relationship with the mentee (Gibson, 2004; Sealy & Singh, 2009). Role models and mentors also differ in terms of permission and involvement. Individuals can choose their own role model without involvement or permission of this role model. Mentors, on the other hand, need to agree to participate in the mentor-mentee relationship (Sealy & Singh, 2009). Individuals become role models when others choose to emulate them. For role models to be effective three criteria need to be met: 1) The role model needs to be as similar as possible, 2) The success of the role model needs to be perceived as attainable (Lockwood & Kunda, 1997) and, 3) The student needs to care about his or her own performance in the specific field of study (Asgari et al., 2011; Marx & Roman, 2002; Parks-Stamm et al., 2007).

2.2 Perceived identity compatibility

Role models can combat stereotypes by changing people's ideas of fixed groups. Perceived identity compatibility concerns the extent to which people perceive their identity to fit with their identity as a member of a group (Shin et al., 2016). Drawn from previous social identity theory research, people develop multiple social identities based on their career, gender, race, and status. Social contexts bring out and strengthen thoughts, goals, and behaviour consistent with these social identities (Rosenthal et al., 2011a).

Perceived identity compatibility between being a woman and being in a male-dominated field of science is an important element for retention in science (Rosenthal, London, Levy & Lobel, 2011a;

Shapiro & Williams, 2012; Shin, Levy and London, 2016). Incompatibility between gender and field of study, caused by feelings of alienation and sexism, pull women away from science and especially from the male-dominated fields (Rosenthal, London, Levy, Lobel & Herrera-Alcazar, 2011b). Increasing feelings of perceived identity compatibility have been found to be a good predictor of better performance and greater interest in remaining in non-traditional fields (London, Rosenthal, Levy & Lobel, 2011; Rosenthal et al., 2013). In cross-sectional studies with undergraduate women and role models in STEM fields, higher perceived identity compatibility between being a women and being in STEM resulted in a greater sense of belonging in the field (London et al., 2011; Rosenthal et al., 2011). In a later study conducted by Rosenthal and colleagues (2013), pre-medical track students showed an increase in perceived identity compatibility after being exposed to a female physician. In turn, leading to a greater sense of belonging in the field and greater interest in pursuing a career as a physician (Rosenthal et al., 2013). In other words, to contradict stereotypes of gender incompatibility, female role models may be effective for women in non-traditional fields. These role models illustrate that women can fit and prosper in those fields demonstrating compatibility (Rosenthal et al., 2013).

2.3 Sense of belonging

Another measure of testing the impact of stereotypes, is the sense of belonging. The Sense of belonging is defined as one's personal belief that one is an accepted, valued and legitimate member of a community (Good et al., 2012; Lewis et al., 2016). Belonging has long been recognized as a natural need and an important driving force of well-being and reflects one's perceived fit within a group (Lewis et al., 2016). A low sense of belonging is a potential mechanism for women's decreased representation and students switching their major (Lewis et al., 2016). Individuals may opt out and move to a profession that is more compatible with the female stereotypes (Good et al., 2012). A higher sense of belonging results in better grades, higher motivation (Lewis et al., 2016) and greater intent to pursue a career in the specific field (Rosenthal et al., 2013). Many STEM fields encourage behaviour like assertiveness, self-promotion, and competitiveness. Characteristics that are often at odds with traditional female gender roles. As a result, women feel like an outsider which is causing them to leave their major (Lewis et al., 2016). Their level of sense of belonging is low, they feel like they don't belong.

Female role models may increase the sense of belonging because the specific field of study seems to be more compatible with the female gender (Rosenthal et al., 2013). Students who believe that others view a certain STEM ability as acquirable are able to maintain a high sense of belonging. Doing so may help eliminate the culture of 'giftedness' and foster a culture in which anyone can develop his or her skills, what for many women can feel like that she belongs in STEM (Good et al., 2012). Findings show that increasing the visibility of a students' ingroup in academic environments increases their sense of belonging and motivates them to stay in science (Dasgupta, 2011).

2.4 Self-efficacy

Besides feeling that you belong somewhere, people also need to have a high level of self-efficacy. Self-efficacy is defined by Bandura (1984) as "judgment of one's capabilities to organize and execute courses of action required to attain designated types of performances" (Bandura, 1984, p.391) as well as one's confidence in one's skills to perform a task (Pintrich, Smith, Garcia & Mckeachie, 1993).

People avoid threatening situations which they believe will exceed their abilities. They only get involved in activities when they judge themselves capable of handling the specific situation. Students will not try to attain their PhD's if they are not confident that they can succeed. Efficacy expectations determine how much effort people will expend and how long they will persist. The stronger the perceived self-efficacy, the more persistent (Bandura, 1978).

Academic self-efficacy measures students' perceptions of their ability to be successful in academics. Results of research by Zumbrunn and colleagues indicate that supportive messages from instructors may bolster students' self-efficacy beliefs. Instructors or role models can inspire students (Zumbrunn, McKim, Buhs & Hawley, 2007). Yet, it can also deflate motivation. Hoyt and Simon (2011) demonstrate that elite female leaders had self-deflating effects on participants' leadership aspirations. However less elite role models, whom the women could identify with more, did not have this negative impact. Whether students assimilate or contrast themselves from the role model depends on the extent that individuals are able to identify with them and deem their success as attainable. It might be the case that women with high levels of self-efficacy will view the success of elite role models as attainable and thus not demonstrate the self-deflating effects resulting from contrast processes (Hoyt & Simon, 2011). Increased exposure to ingroup peers and experts is likely to increase resilience in a domain. Individuals are strongly influenced by social comparisons with ingroup members, especially in a domain in which their group is negatively stereotyped (Dasgupta, 2011).

2.5 Attainability

As mentioned, a role model will only have a positive influence when you can see yourself having similar qualities as these role models in the future. In other words, the qualities of the role model seem attainable. Besides imagining yourself attain outstanding accomplishments, you must also believe in your own capabilities and that you are capable of comparable success. You can watch the superb performance of an Olympic athlete without experiencing any change in self-evaluation or motivation when you are not athletically inclined. So, a role model' success must be seen as attainable. Yet, upward social comparison with an ingroup member can be a threatening experience that makes women question their own capabilities. Not all success is inspiring because not all success seems attainable (Rudman & Phelan, 2010). As a consequence, research on role model attainability has been inconclusive (Asgari et al., 2011; Hoyt, 2013).

2.5.1 Negative effects of role models' attainability

Female role models that women do not identify with have negative effects on women's career aspirations and self-perceptions (Asgari et al., 2011; Hoyt and Simon, 2011; Lockwood & Kunda, 1997; Parks-Stamm, 2007). Women in role model positions who are viewed as too different from themselves may backfire, making women view themselves as even more lacking the qualities for a position similar as the role model's (Asgari et al., 2011; Dasgupta, 2011).

Success can also seem unattainable when the star is a peer and already unreachable or when the star's success is so extreme that it appears to be beyond most people's grasp. Role models in the same stage of their career are perceived as more threatening. Their accomplishments are easier to compare to one's own. When the role model is more successful it can lead to discouragement and self-deflation instead of motivation (Lockwood & Kunda, 1997).

When a woman is seen as extremely competent in a male-dominated job, her success is not always seen as attainable. The success of the role model in a traditional masculine domain brings to mind the struggle it must have been for this woman to get there (Parks-Stamm, 2007; Derks, 2011). She is an exception by which other women feel threatened. Parks-Stamm (2007) stated that female vanguards with whom students do identify with can even steer women towards female-dominated jobs because they feel that these domains are those in which they will most likely succeed. Social comparison to an upward target can be very painful to the self. Instead of inspiring, these women are unlikeable and interpersonally hostile (Parks-Stamm et al., 2007). It can lower women's implicit leadership self-concept. But, so can exposure to traditional women, reflecting a double threat (Rudman, Moss-Racusin, Phelan & Nauts, 2012).

2.5.2 Positive effects of role models' attainability

Highly motivated individuals are likely to be spared feelings of inferiority after comparison with an accomplished role model because they assume to be more similar to the high performing role model (Gibson, 2004; Lockwood & Kunda, 1997). Even when the person realizes that she is currently less successful, the role model can still inspire when these feelings are accompanied by the belief that similar success is still attainable in the future (Lockwood & Kunda, 1997).

In research by Stout (2011), female STEM students who interacted with advanced female peers, showed an increase in positive implicit attitudes towards math, but also influential female engineers boosted female students' implicit attitudes. Students did, however, feel less threatened and more positively challenged by peer role models (Stout, 2011). Individuals may vary in choosing a role model based on their own advancement in a specific field. The variation in experience or hierarchical position of the proposed role model tends to relate to the subject of interest and the students own hierarchical status. Research in mentoring noted the tendency of individuals to seek superior mentors for information on how to advance, and peers for day-to-day inspiration. On the one hand, if individuals are at relatively low levels and seeking to advance, they tend to focus on upward role models as valid indicators of how to achieve a more advanced position. On the other hand, if they have reached a level where further upward advancement is unlikely, they tend to look at peers or downward for new ways of achieving in their current position. Further, as individuals reach the top of an organization, they may be more inclined to look for role models in more distant locales, such as in other organizations, fields, or among their clients (Gibson, 2004). Hoyt and Simon (2011), conducted a laboratory study in which respondents had to perform a leadership task in a virtual environment. Respondents read a role model profile from either a high-level, middle-level or control condition. The high and middle-level role models were women from several fields in an earlier stage (middle-level) or later stage (high-level) of their career. Respondents reported identifying significantly more with the middle-level role model compared to the high level. The findings suggest that the middle-level female leaders increase positive feelings because they are not presented as 'different' than the norm, they successfully disconfirmed the stereotype that women cannot fulfil leadership positions (Hoyt, 2012).

There are situations in which high-level role models can still have positive effects. In research by Marx and Roman (2002), results show that a female role model as a highly competent math tutor instead of a peer role model benefits both male and female students as long as she is still perceived as similar in terms of shared interests (Dennehy & Dasgupta 2017; Marx and Roman, 2002). The effects that may occur are depending on the level of identification with the female role model and

the domain in which the female role model has excelled (Marx & Roman, 2002). Only when success seems attainable and relevant, a role model can strengthen the belief in one's own capabilities (Lockwood & Kunda, 1997).

We expect that in the high attainability, a PhD student, condition role models would increase the sense of perceived identity compatibility, resulting in a higher sense of belonging, higher scores on self-efficacy, and finally to greater interest in having a career in science as opposed to the low attainability (a professor) condition. This led to the following set of hypotheses:

H1a **A high attainable role model has a positive effect on students' perceived identity compatibility**

H1b **A high attainable role model has a positive effect on students' sense of belonging**

H1c **A high attainable role model has a positive effect on students' self-efficacy**

2.6 Similarity

Role model research suggests that exposure to successful ingroup members enhances motivation and aspiration. People are most likely to draw analogies between two objects when the two resemble each other in features, structure, and purpose (Lockwood & Kunda, 1997). The similarity-attraction paradigm (Byrne, 1971) suggest that the more similar an individual perceives another person to be, the more that other person is liked (Byrne, 1971; Riordan, 2000). Having the same demographic characteristics results in attraction, on the other hand, a difference in demographics repels. Repelling can be in the manner of activating categorization processes or projecting stereotypes (Lankau, Riordan & Thomas, 2005).

Lankau and colleagues (2005) make a distinction between perceived demographic similarity and deep-level similarity. The first includes age, tenure, education and functional expertise. Deep-level similarity is based on Riordan's (2000) work on relational demography. It includes personality, interests, work values and personal values (Riordan, 2000). As there is no interaction with a role model, perceived demographic similarities are important for a role model to be able to inspire people and let them imagine similar qualities and similar success in the future (Asgari et al., 2010).

An effective form of perceived demographic similarity is gender. Research shows that female students in all fields of study are more inspired by female role models than they are by male role models (Marx & Roman 2002; Rosenthal et al., 2013). A mentor of the same gender increases the sense of belonging, confidence and ultimately retention of women in science (Dennehy & Dasgupta, 2017; Lewis et al., 2016; Marx & Roman, 2002; Rosenthal et al.,2013; Wohlford, Lochman & Barry, 2004). These benefits of a same-gender role model have a long-lasting effect on students after mentoring (Dennehy & Dasgupta, 2017). To further improve the effectiveness of a role model more similar traits are investigated.

In the study by Lockwood and Kunda (1997), students, learning to become accountants or teachers, rated role models who were outstanding in the same profession as their own as more relevant than an outstanding role model from a different profession. Relevant, in this case, in being active in the

same profession. These two professions were found to be sufficiently different from each other, that a future teacher might find the accountant completely irrelevant. Relevant role-models were more likely to provoke inspiration than the irrelevant role-model. Inspiration by an outstanding other is more likely to be induced by a relevant role-model on the demographic level (Lockwood and Kunda, 1997). Asgari and colleagues (2011) investigated the effect of more background information and found that a similar university, where the role model graduated, was an effective addition to the role model profile. Female students' beliefs about their own abilities were more positive after seeing a successful role model who was framed as similar in terms of gender, personality or university they went to college to (Asgari et al., 2011; Lockwood & Kunda, 1997). Marx and Roman (2002) stated that one's identification with the group and the domain in which the female role model is active are potentially significant factors for the positive effects of female role models (Marx & Roman, 2002).

Even though all participants and role models are active in science, a difference in the role models' field of study is expected to have an influence on the student. Therefore, we expect that for similarity, the fitted condition will increase students' perceived identity compatibility, sense of belonging and self-efficacy as opposed to the no-fit condition. This led to the following set of hypotheses:

H2a **A similar role model has a positive effect on students' perceived identity compatibility**

H2b **A similar role model has a positive effect on students' sense of belonging**

H2c **A similar role model has a positive effect on students' self-efficacy**

Also, an interaction effect between similarity and attainability is expected. Expected is that the fitted PhD student role model has a positive effect compared to a professor from a different field.

H3a **A high attainable and similar role model has a positive effect on students' sense of belonging**

H3b **A high attainable and similar role model has a positive effect on students' perceived identity compatibility**

H3c **A high attainable and similar role model has a positive effect on students' self-efficacy**

2.7 Differences in field of study

There are differences between subfields in academia (Giazzonni, 2009; Harris, 1993). Snow first called it 'The Two Cultures phenomenon' in 1965. It consists of a conflict between academic communities of the natural sciences and humanities. This phenomenon is not a matter of misunderstanding and jargon but lies deeper. There are issues about tradition, culture and the theory of 'knowledge' that is perceived as deeply and fundamentally different among academic disciplines. Students in the natural sciences generally consider their view objective and students in the humanities consider their view as more subjective (Giazzonni, 2009).

A survey study (Leslie et al., 2015) revealed that some fields are believed to require different attributes than others for their candidate professors. In some fields attributes as raw talent and

genius were required of a candidate whereas in others empathy and hard work were more valued. Fields in which raw talent and brilliance was required, had lower percentages of women in their academic departments (Leslie et al., 2015). The two field of study, humanities and natural science, each has its own distinctive cultural characteristics further elaborated in the next paragraphs (Becher, 1994; Van den Brink, 2010; Van den Brink & Benschop, 2011).

2.7.1 Humanities

Humanities can at its best be associated with interest in ideas, which can lead students into wanting to apply ideas in class and do more than the required work. Its culture is based on interaction and discussion which can stimulate alert, insightful contributions. The weakness of humanities is that it can reward students who are verbally adept but sail along on the surface of their studies without working very hard (Brint, Cantwell & Hanneman, 2008).

A full professor in the humanities is valued based on his or her research- and teaching skills. Because of the large student population teaching takes a substantial amount of time. The culture among professors in humanities can be described as individualistic and fragmented, the research field consists of small units and each must fight for himself. There is no citation index in which publications can be counted because often they are published in books, national journals or in another language than English. The definition of an excellent researcher is thus much more debatable than in other subfields. Therefore, the personality and leadership style of a candidate takes a prominent position in the selection process of a new professor. The majority of respondents in the research by Van den Brink (2010), consider the 'gender issue' in humanities to be out-dated. Yet in fact, organizational practices continue to categorize and hierarchize between men and women. It's a structure with informal rules that have to be followed. In order to know how to play it, it is beneficial to have a mentor or contacts with this 'old academic tradition'. Often women do not have access to these elites and are unaware of the rules involved (Van den Brink & Benschop, 2011).

Because of the strong hierarchy and the individualistic nature of this field where personality is very important a less progressed role model who is clearing a path to the top of the hierarchical ladder is expected to be more effective as a role model. This led to the following set of hypotheses:

H4a **In humanities a high attainable and similar role model has a positive effect on students' perceived identity compatibility**

H4b **In humanities a high attainable and similar role model has a positive effect on students' sense of belonging**

H4c **In humanities a high attainable and similar role model has a positive effect on students' self-efficacy**

2.7.2 Natural Sciences

The strength of the natural sciences culture of engagement is that it can generate hard work, collaborative study, and technically competent performances in demanding fields that do not give out rewards very easily. The culture of engagement can, on the other hand, reward hardworking but

unimaginative students who perform tasks competently but have little initiative outside required activities and in connecting ideas or interacting with professors. Interest in 'getting the job done' greatly outweighs having inspiring and creative ideas (Brint et al., 2008).

Assessing the quality of candidates for full professor in the natural sciences has one dominant criterion; professional capital. Research quality, which is assessed through publications, the track record on obtaining grants and international reputation predominates. There is a strong belief in objectivity and research quality is easy to measure. The smallest discrepancy can be seen between female potential and appointments of professors in the natural sciences. However, both female potential and the number of female professors is low. As a result, women find themselves in a token position. Still, women lose the competition to equally qualified men. To achieve the same rating as a man, women must have a significantly superior résumé. The 'intrinsic' ability of women to excel in natural and technical sciences is often questioned. Masculinity and power are intertwined in such a way that men represent the standard; they naturally represent the norm (Van den Brink and Benschop, 2011).

Because de natural sciences highly value objectivity it is expected that female students are more likely to seek a professor as a role model. Progression to a higher level is very transparent and therefor easier to picture yourself there. This expectation led to the following hypotheses:

H5a **In natural science a less-attainable and similar role model has a positive effect on students' perceived identity compatibility**

H5b **In natural science a less-attainable and similar role model has a positive effect on student' sense of belonging**

H5c **In natural science a less-attainable and similar role model has a positive effect on students' self-efficacy**

2.8 Present investigation

In the present investigation, we aimed to build upon and integrate the aforementioned lines of work on same-gender role models (Asgari et al., 2010; Asgari et al., 2011; Gibons, 2004; Hoyt, 2012; Lockwood & Kunda, 1997; Marx & Roman, 200; Parks-Stamm et al., 2007; Sealy & Singh, 2009), sense of belonging (Good et al., 2012; Lewis et al., 2016; Rosenthal et al., 2013), self-efficacy (Bandura, 1984; Hoyt & Simon, 2011; Lewis et al., 2016; Zumbrunn et al., 2007) and perceived identity compatibility (Lonon et al., 2011; Rosenthal et al., 2011; Rosenthal et al., 2013) to help clarify the processes or mechanisms involved in women's pursuit of a scientific career. We expected that exposure to female role models would increase perceived identity compatibility between being a woman and being a researcher, greater sense of belonging in science and higher scores on self-efficacy. Specifically, we tested five sets of hypotheses in an online experimental study with female humanities and natural sciences students attending a technical university in the East of the Netherlands.

2.8.1 Research model

To conclude the theoretical framework, the following research model is set up (figure 1). On the left side, the independent variables ‘similarity’ and ‘attainability’ are presented. The arrows represent their effects on the students which consist of their ‘perceived identity compatibility’, ‘sense of belonging’, and ‘self-efficacy’.

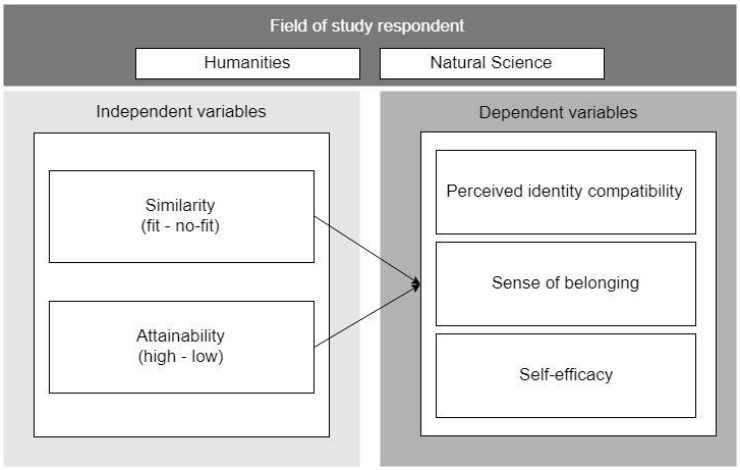


figure 1: *Research model*

2.9 Hypotheses overview

Table 1:

Overview of hypotheses

Number	Hypotheses
H1a	A high attainable role model has a positive effect on students' perceived identity compatibility
H1b	A high attainable role model has a positive effect on students' sense of belonging
H1c	A high attainable role model has a positive effect on students' self-efficacy
H2a	A similar role model has a positive effect on students' perceived identity compatibility
H2b	A similar role model has a positive effect on students' sense of belonging
H2c	A similar role model has a positive effect on students' self-efficacy
H3a	A high attainable and similar role model has a positive effect on students' sense of belonging
H3b	A high attainable and similar role model has a positive effect on students' perceived identity compatibility
H3c	A high attainable and similar role model has a positive effect on students' self-efficacy
H4a	In humanities a high attainable and similar role model has a positive effect on students' perceived identity compatibility
H4b	In humanities a high attainable and similar role model has a positive effect on students' sense of belonging
H4c	In humanities a high attainable and similar role model has a positive effect on students' self-efficacy
H5a	In natural science a less-attainable and similar role model has a positive effect on students' perceived identity compatibility
H5b	In natural science a less-attainable and similar role model has a positive effect on students' sense of belonging
H5c	In natural science a less-attainable and similar role model has a positive effect on students' self-efficacy

3. Method

3.1 Research design

For this research, an experimental research design was used. An online survey research with a 2 (attainability: high vs. low) x2 (similarity: fit vs. no-fit) between subject design was conducted by using the online survey software Qualtrics. With an online survey, a large group of female students could be reached and at the same time their anonymity could be guaranteed. This leads to a higher reliability because of less respondents who answer in a socially desirable way because they remained anonymous. For the main study there were four different profiles that were tested among two groups of students. Each profile presented a woman in the position of a PhD student (high attainable) or professor (low attainable) and she either worked in a similar (fit) field as the respondent or a different (no-fit) field. The two groups of students included in this research were humanities students and natural science students. An overview of the 2x2 between subject design is presented in Table 2.

Table 2:
Number of participants per condition

		PhD (n)	Professor (n)
Humanities	Fit	24	22
	No-fit	21	24
Natural Science	Fit	29	27
	No-fit	28	35

3.2 Stimulus materials

The four profiles used in this study were identical (gender, University, achievements) except for their level of attainability and similarity and are based on the profiles used in the studies by Asgari and colleagues (2011) and Rosenthal and colleagues (2013). Profiles contained the same picture in both fit and in the no-fit condition, preventing any effects caused by different pictures (Jenkins, White, Van Montfort & Burton, 2011; Todorov & Porter, 2014). The women in the pictures are unknown by the respondents to keep the role model prerequisites of which the person does not have any contact with the role model (Gibson, 2004; Sealy & Singh, 2009).

3.2.1 Attainability

The level of attainability of a role model was based on the progression in their academic career (Hoyt, 2011). In the more attainable condition, students saw a profile with a PhD student (proximal outcome). This is the first step, after obtaining a master degree, if someone would want to pursue a career in science. In the less attainable condition, students saw a profile with a professor (distal outcome). This is one of the highest positions in an academic environment (Rosenthal et al., 2013).

3.2.2 Similarity

This research is interested in the possible differences between humanities and natural science. The role models were therefore either working in humanities or natural science. In the fitted condition, the role model worked in the same field as what the student was studying, in the not fitted condition it was different. The studies chosen to represent the fields of study are for humanities: psychology and for natural science: chemistry. These two studies were found to be sufficiently different from each other, that a psychology student might find the chemistry PhD/professor completely irrelevant as for the chemistry student the psychology PhD/professor (Lockwood & Kunda, 1997).

3.2.3 Preliminary test

To construct the stimulus materials for the main study, a short preliminary study was conducted. This pre-test goal was to see if the profiles met the three key features of a role model 'similarity, 'inspiration, and 'relevance (Lockwood & Kunda, 1997; Wohlford, Lochman & Barry, 2004). Besides a control of the key features also a suitable photo to represent the PhD student and the professor was picked through a pre-test.

Pre-test Profile

For the pre-test of the profile, 17 female students participated in an online questionnaire. Students read both, PhD and professor, profiles. Directly after each profile, respondents were asked to answer three questions on a five-point scale. 'How similar do you think you are too the person you read about?', 'Overall, how relevant is this profile to you?', and 'How inspirational is this profile to you?'. Results of the independent *t*-test can be found in Table 3.

Table 3:

Results independent t-test preliminary test

	PhD (n=17)		Professor (n=17)	
	M	*P*	M	*p*
Similarity	3,18	.455	2,35	.011*
Inspiration	4,06	<.001*	3,76	.001*
Relevance	2,94	.805	2,82	.382

Note. (*) Indicates a significant difference from the midpoint of the scale

Respondents rated the PhD profiles on the extent to which the role models were perceived as similar to them (M=3,18, SD=0.95), inspiring (M=4,06, SD=0.66), and relevant (M=2,94, SD=0.97).The scores for two of these items showed no significant difference with the midpoints of the scales. One item, 'inspiration' scored significantly higher than the midpoint of the scale, suggesting that the profiles contained the key features of role models.

The professor profiles scored on the extent to which the role models were perceived as similar (M=2,35, SD=0.93), inspiring (M= 3,76, SD=0.75), and relevant (M=2,82, SD=0.81). The scores for two of these items showed significant difference with the midpoints of the scales. One item, 'inspiring' scored significantly higher than the midpoint of the scale. For similarity the profiles scored

significantly lower than the midpoint of the scale. This is however, not surprising as the professor is further progressed and at a very different point in her life than the respondents. Suggesting that the profiles contained the key features of role models. See Appendix A for complete procedure of the pre-test.

The key features similarity and relevance did not show any significance, or scored lower than the midpoint of the scale. This is expected to be caused by a mis-fit between field of study of the respondent and the profile. Respondents read a profile of a PhD student or professor from natural science or humanities regardless of their own study. Because inspiration, an important key feature, is checked and no key features scored lower than the midpoint of the scale except for one, these profiles are used in the main study. Similar results were found in research by Shin and colleagues (2016) and pointed out that these results can be assigned to the differences in field of study. The profiles can be found in Appendix B.

Pre-test Photo

To make sure the photos used in the profile fitted the image of a high attainable woman (PhD) and a low attainable woman (Professor) a pre-test was conducted. 32, as neutral as possible, pictures were tested and 12 female students participated in the Q-sort.

Six of the participants were asked to divide 16 pictures of proposed PhD students in three piles and then place them in the Q-sort. Participants conducted the Q-sort twice, three of them started with imagining the woman working in humanities and the second time in natural science. The other three respondents started with natural science and then humanities. Six female students did the same but then divided 16 pictures of proposed professors in three piles and then in the Q-sort.

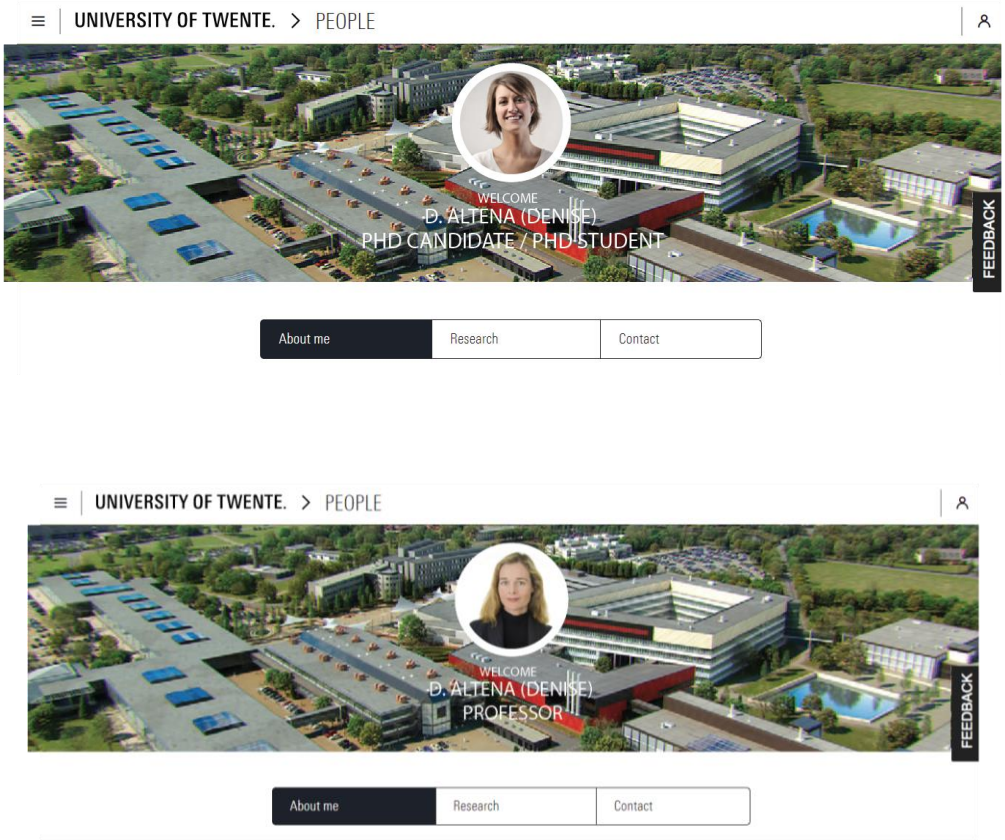
After completing the Q-sort, the six photos that were placed on the outer right part of the Q-sort were selected for the second part of the pre-test. Participants answered four statements on a 5-point scale on whether the woman in de picture is a good representative for her occupation, if she is likeable, competent and if her position is attainable. Respondents were also asked to estimate the woman's age, to see if this fitted with the profile.

Woman 3

Woman 2

| figure 2: *Main study – stimulus photo's*

The selected photos are presented in Figure 2. Woman 3 was selected to represent the professor in the main study and woman 2 represents the PhD student. Complete results of the pre-test can be found in Appendix C. The final version of the stimulus materials can be found in Figure 3.



|figure 3: *main study – stimulus material*

3.3 Measurement instrument

The online survey for the main study contained three parts. First, the research was explained to the respondent, followed by some demographical questions to make sure only female students filled in the questionnaire. Then, respondents saw one of four profiles after which they answered the questions for the main analysis. Last, two recall questions had to be answered, followed by a thank you text for participating. This section describes the used scales and their reliability.

3.3.1 Perceived identity compatibility

To measure the compatibility of the respondent with being a researcher a single-item measure "Inclusion of Other in the Self" has been completed. This scale is developed by Aron, Aron and Smollan (1992). It has been used across many domains, including women in STEM (London et al., 2011; Rosenthal et al., 2011; Shin et al., 2016). Participants were asked to select one pair of progressively overlapping circles out of seven choices. One circle represents the respondent's gender, the other circle represents being a researcher. This measure has an excellent test-retest reliability and is easy for participants to understand (Rosenthal et al., 2013).

3.3.2 Sense of belonging

Mendoza-Denton and colleagues (2002) developed a scale for measuring sense of belonging. This scale exists of three sets of questions on a five-point scale. The first set contains questions on the respondents feelings towards their study (e.g. "How do you feel about your study?" *Thrilled – Miserable*). The second set contains questions on feelings towards their peers and the third set towards their professors (e.g. "How do you feel towards your peers and classmates in your study?" *Definitely fit in – Do not fit in)*. These three sets of questions combined measured respondents sense of belonging in science and has been previously used in research on women in science (London et al., 2011; Rosenthal et al., 2011a) (α=.85).

3.3.3 Self-efficacy

To measure self-efficacy respondents completed eight questions on a 5-point scale from strongly disagree to strongly agree. This scale was adapted from the MSLQ-scale by Pintrich et al. (1993) and is previously used in a study by de Fátima Goulão (2014) for measuring self-efficacy in adult learners. Questions concerned participants confidence in successfully completing, understanding and executing tasks in their master program (e.g. "I believe I will receive an excellent score in my study program", "I'm confident I can understand the most complex material part of my study program") (α=.86).

3.3.4 Manipulation check, key features of a role model

In the preliminary test the key features of a role model were tested. These features were again tested in the main study. Respondents answered three single item measurements in which they rated how similar, relevant and inspirational they found the profiles, on a scale from 1(not at all) to 5 (completely) (Rosenthal et al., 2013). These three key features of role models which are demonstrated by previous studies (Lockwood & Kunda 1997; Wohlford et al. 2004). Results are presented in Table 4.

Table 4:

Results independent t-test: Key features of a role model main study

	PhD (n=102)		Professor (n=108)	
	M	*p*	M	*p*
Similarity	2.47	<.001*	2.18	<.001*
Inspiration	3.31	.001*	3.27	.005*
Relevance	2.59	<.001*	2.47	.013*

Note. (*) Indicates a significant difference from the midpoint of the 5-point Likert scale.

All results are significantly different from the midpoint of the scale. However, only for inspiration these results were positive. In the research by Shin, Levy and London (2016) this was also the case. It is expected that these results can be explained because there was no exact match between field of study of the respondent and the profile. As these profiles still score significantly higher than the midpoint of the scale for inspiration it is assumed that the role model prerequisites are sufficiently enough to continue this research.

3.3.5 Control questions

Respondents were controlled on several points to be confident that these factors did not influence the results of this study. The following questions were used as a randomization control: Attitude towards science, interest in a career in science, study motivation and grades. The complete set of questions can be found in Appendix D. There was no significant difference, for any of these questions, between conditions.

To keep up with the aforementioned prerequisites of respondents rating the writing style of the profiles, respondents were asked whether the text was inspiring, easy to read, informative and entertaining. For these items there was also no significant difference found between conditions.

3.4 Participants

In total, 335 respondents, recruited at the University of Twente, participated in this research. However, after taking a closer look at the data a big group of respondents had to be excluded. In total, a number of 125 (37,3%) responses have been deleted of which 41 respondents gave the wrong answer to the control question ("What was the position of the profile you read about?" and "In what field of study was the person you read about active?"). The other 81 responses that were deleted contained a small number of male respondents and mostly not completed responses. As a result, 210 responses were used for further analysis. Respondents participated in the questionnaire after clicking on a link (N=85) or after the researcher recruited respondents on campus (N=125).

3.4.1 Demographics

The mean age of the respondents lies between 23 and 24 years old. Eighty-eight percent of these respondents reported they were born in Europe, 7% in Asia, 1,5% in Africa, 1,5 in South America, 1,5% in Australia, and 1% in North America. Additionally, respondents were asked for how long they have been living in Europe. Eighty-eight percent of the respondents stated that they were living in Europe for more than five years, 8% between one and five years and only 4% are living in Europe for less than a year, see Table 5.

3.4.2 Respondents field of study

In total 25 studies were represented by the respondents. 91 respondents are enrolled in a humanities study and 119 students are enrolled in a natural science study. The sample included master and bachelor students: 140 of the respondents were enrolled in a masters track and 68 in a bachelor program.

The following humanities studies were included in the study: ATLAS, Business Administration, Business Information Technology, Communication Science, European Public Administration, Health Sciences, International Business Administration, Psychology, Educational Science and Technology, Master of Management, Philosophy of Science Technology and Society, Science Education and Communication.

The following natural science studies were included in the study: Advanced Technology, Applied Mathematics, Applied Physics, Biomedical Engineering, Civil Engineering, Creative Technology,

Construction Management Engineering, Electrical Engineering, Embedded Systems, Human Media Interaction, Industrial Design, Mechanical Engineering, Sustainable Energy Technology, Technical Computer Science, Technical Medicine. A complete overview of the study distribution can be found in Table 12 in Appendix E.

Table 5:

Demographics main study

	N	%
Age	210	100
Under 21	49	23,3
21 – 25	131	62,4
26 or older	30	14,3
Origin	210	100
Europe	185	88,1
Asia	14	6,7
Africa	3	1,4
North America	2	1,0
South America	3	1,4
Australia	3	1,4
Years living in Europe	210	100
Less than 1 year	9	4,3
More than 1, less than 5 years	16	7,6
More than 5 years	185	88,1

Note. N = number of respondents, % = the percentage of the total of respondents

4. Results

In the following chapter, the results of the different conducted analyses will be described in detail. To test the formulated hypotheses of this study, a multivariate analysis of variance (MANOVA) has been conducted. The three dependent variables, perceived identity compatibility, sense of belonging and self-efficacy, were tested in relation to two independent variables (attainability and similarity). The assumptions for conducting a MANOVA were checked and met. First, the effects of the complete sample are presented in paragraph 4.1. Second, in paragraph 4.2, the sample is split in natural science students and humanities students to see if any effects can be assigned to a certain field of study. Detailed table with all descriptive statistics can be found in Appendix F.

4.1 Main and interaction effects of the complete sample

Results of the MANOVA for the complete sample, which can be found in Table 6 , indicate that significant multivariate differences were found.

Table 6:
Multivariate and Univariate Analyses of Variance for Attainability and Similarity

	Multivariate		Univariate					
			PIC		SoB		SE	
	F[a]	*p*	F[b]	*p*	F[b]	*p*	F[b]	*p*
Attainability	3.33	.021*	4.71	.031*	3.90	.050*	0.33	.566
Similarity	1.98	.118	1.11	.294	2.37	.125	1.18	.297
Attainability * Similarity	3.33	.075	0.13	.717	6.99	.009*	0.25	.615

Note. Multivariate F ratios were generated from Pillai's V statistic. PIC = Perceived Identity Compatibility. SoB = Sense of Belonging. SE = Self-efficacy. [a]Multivariate df = 3, 204. [b]Univariate df = 1, 206. *p <0.001. PIC = 7-point Likert scale. SoB and SE = 5-point Likert scale.

4.1.1 Attainability

The MANOVA shows that there is a statistically significant effect for attainability, (F (3, 204) = 3.33, p = .021; Pillai's V = 0.47, partial η^2 = .047). The partial eta squared indicates that the effect is of small strength. An analysis of variance (ANOVA) was conducted to test the effects for the factor attainability. There was a main effect on the variable perceived identity compatibility (F (3, 204) = 4.713, p = .031, η^2 =.22). Respondents reported a higher score in the professor condition, (M = 5.56, SD = 1.86), compared to the PhD condition, (M = 4.99, SD = 1.83).

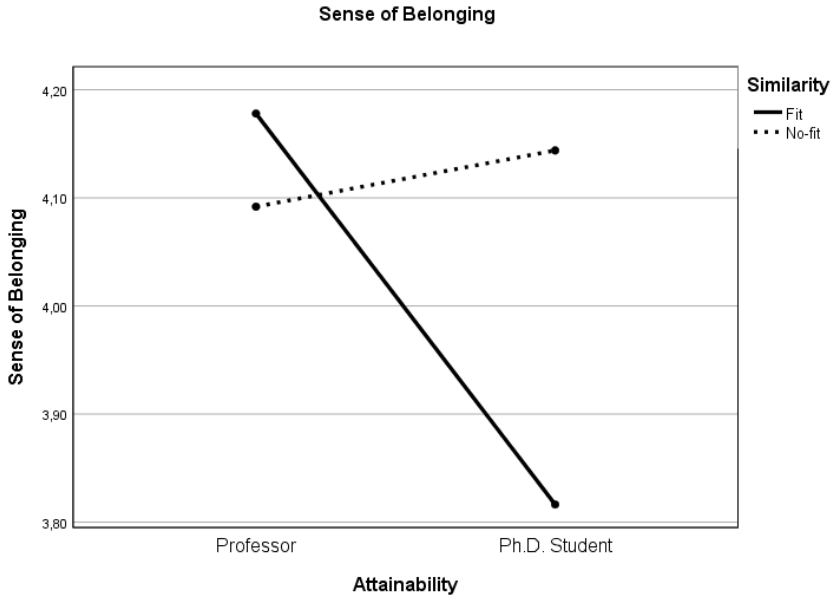
There was also a main effect for sense of belonging, (F (3, 204) = 3.903, p = .050, η^2 =.019). Again, the scores for the professor condition, (M = 4.14, SD = .51) were significantly higher than for the PhD condition, (M = 4.0, SD = .64). There was no statistically significant effect found for the variable self-efficacy, (F (3, 204) = 0.330, p = .566). According to these results, hypothesis 1a, 1b and 1c were not supported.

4.1.2 Similarity

The results of the MANOVA for the factor similarity shows no statistically significant effects on the dependent variables. According to these results, hypothesis 2a, 2b and 2c were not supported.

4.1.3 Interaction Attainability * Similarity

Initially, no significant interaction effect was found on attainability*similarity after the MANOVA. However, after conducting an ANOVA a significant interaction effect in this condition was found. Between the factors attainability and similarity was a statistically significant interaction effect on the variable sense of belonging, (F (1, 206) = 6.968, p = .009, η^2 = .033). After conducting a Post-hoc Bonferonni Test, results pointed out that the mean score for the condition PhD + fit, (M = 3.82, SD = 0.70), was significantly lower than the mean scores of the conditions professor + fit, (M = 4.18, SD = 0.56) and PhD + no-fit, (M = 4.14, SD = 0.54). According to these results, hypothesis 3a, 3b and 3c were not supported.



|figure 4: *Interaction effect of the factors attainability and similarity on sense of belonging*

4.2 Main and interaction effects natural science and humanities respondents

With a MANOVA per group, natural science students versus humanities students, the effects for attainability and similarity and the dependent variables were measured. Results of the MANOVAs, can be found in Table 7.

Table 7:
Multivariate and Univariate Analyses of Variance for Attainability and Similarity

	Multivariate		Univariate					
			PIC		SoB		SE	
	F[a]	*p*	F[b]	*p*	F[b]	*p*	F[b]	*p*
Natural Science								
Attainability	1.09	.355	2.29	.133	0.01	.914	0.29	.591
Similarity	0.30	.829	0.29	.593	0.06	.804	0.39	.532
Attainability * Similarity	0.83	.478	0.23	.636	1.81	.182	0.96	.329
Humanities								
Attainability	3.09	.032*	2.72	.103	7.13	.009*	0.07	.787
Similarity	2.32	.082	1.14	.289	3.77	.055	0.93	.334
Attainability * Similarity	2.45	.069	1.31	.256	6.09	.016*	0.15	.700

Note. Multivariate F ratios were generated from Pillai's V statistic. PIC = Perceived Identity Compatibility. SoB = Sense of Belonging. SE = Self-efficacy. [a]Multivariate df Natural Science = 3, 113, Humanities = 3, 85. [b]Univariate df Natural Science = 1, 115, Humanities = 1, 87. *p <0.001. PIC = 7-point Likert scale. SoB and SE = 5-point Likert scale.

4.2.1 Natural science

No significant results were found for the group natural science after conducting a MANOVA.

4.2.2 Attainability humanities

The MANOVA for the group humanities indicated significant multivariate differences for attainability, (F (3, 85) = 3.09, p = .032; Pillai's V = 0.98, partial η^2 = .098. An ANOVA was conducted to test the effects for the factor attainability. A statistically significant effect for the variable sense of belonging, (F (1, 87) = 7.12, p = .009, η^2 = .076) was found. Respondents reported higher scores for the professor condition, (M = 4.16, SD = .54) than for the PhD condition, (M = 3.88, SD = .73).

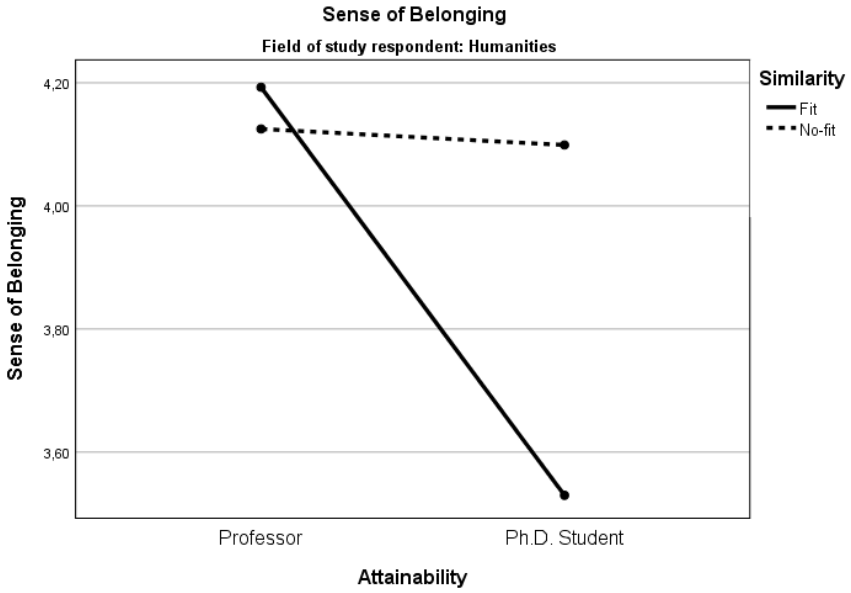
4.2.3 Similarity humanities

The results of the ANOVA for the factor similarity showed no statistically significant effects.

4.2.4 Interaction Attainability * Similarity in Humanities

Initially, no significant interaction effect was found on attainability*similarity. However, after conducting an ANOVA a significant interaction effect between attainability*similarity was found on the variable sense of belonging, (F (1, 87) = 6.086, p = .016, η^2 = .065). The partial eta squared indicates that the effect is of medium strength. After conducting a Post-Hoc Bonferroni Test, results pointed out that the mean score for the fitted PhD condition (M = 3.53, SD = 0.77), was significantly

lower than the mean scores of the fitted professor condition, (M = 4.19, SD = 0.59), not fitted professor (M = 4.13, SD = 0.48) and the not fitted PhD condition, (M = 4.09, SD = 0.59). According to these results, hypothesis 4a, 4b, 4c, 5a, 5b and 5c are not supported.



|figure 5: *Interaction effect of the factors attainability and similarity on sense of belonging*

4.3 Hypothesis table

Table 8:

Overview of the results of hypotheses

Number	Hypotheses	
H1a	A high attainable role model has a positive effect on students' perceived identity compatibility	X
H1b	A high attainable role model has a positive effect on students' sense of belonging	X
H1c	A high attainable role model has a positive effect on students' self-efficacy	X
H2a	A similar role model has a positive effect on students' perceived identity compatibility	X
H2b	A similar role model has a positive effect on students' sense of belonging	X
H2c	A similar role model has a positive effect on students' self-efficacy	X
H3a	A high attainable and similar role model has a positive effect on students' sense of belonging	X
H3b	A high attainable and similar role model has a positive effect on students' perceived identity compatibility	X
H3c	A high attainable and similar role model has a positive effect on students' self-efficacy	X
H4a	In humanities a high attainable and similar role model has a positive effect on students' perceived identity compatibility	X
H4b	In humanities a high attainable and similar role model has a positive effect on students' sense of belonging	X
H4c	In humanities a high attainable and similar role model has a positive effect on students' self-efficacy	X
H5a	In natural science a less-attainable and similar role model has a positive effect on students' perceived identity compatibility	X
H5b	In natural science a less-attainable and similar role model has a positive effect on students' sense of belonging	X
H5c	In natural science a less-attainable and similar role model has a positive effect on students' self-efficacy	X

5. Discussion

This research aimed to answer the following research question: To what extent have the similarity and attainability of female role models, an effect on female students' perceived identity compatibility, sense of belonging and self-efficacy?

A role model can be a tool to help young women to stay in science and to pursue a career as a professor (Lockwood & Kunda, 1997; Asgari et al., 2010; Hoyt, 2012). To be inspired by an outstanding woman, a woman needs to believe she is capable of comparable success; the role model's success must be considered attainable (Lockwood & Kunda, 1997). In this research, attainability was manipulated by presenting respondents a profile of a high attainable role model (PhD student) or a low attainable role model (Professor). Besides having attainable success, a role model also needs to be perceived as similar to the self. Marx and Roman (2002) stated that the field in which a role model is active may be of importance for the positive effects of these role models. Where other research only investigated a specific group of students (Cheryan et al., 2012; Marx & Roman, 2002; Stout, 2011) or students and role models who were not active in the same field/profession (Asgari et al., 2011; Hoyt & Simon, 2011; Parks-Stamm et al., 2007; Rudman & Phelan, 2010), this study investigates two fields of study with role models from these fields to investigate the effects of similarity of role models in academia.

5.1 Discussion of main findings

This research shows that in an academic context, professors are a better role model for female students than PhD students to increase the female students' sense of belonging in their field of study and their perceived identity compatibility with science.

This is different from the hypothesized effect, as it was expected that PhD students were a better role model. Contrary to the PhD student condition, the professor condition showed a significantly higher score on respondents perceived identity compatibility and sense of belonging when the student and the professor have the same major. A possible explanation for this result is two-sided. On the one hand the PhD student could be perceived as a threat due to her success. On the other hand the professor condition was relatively attainable compared to previous research in which famous leaders were presented. This will be further elaborated on in paragraph 5.2.1. More research is necessary to find out if there is a level at which a professors success is no longer perceived as attainable. What would then be the point where her achievements are of such a high level that the effect of the role model shifts from inspiring to deflating?

The field of study of the role model is of less importance than her position. When at least the gender and the educational institution is similar to that of the student, similarity in field of study is not necessary for positive effects. The similarity in field of study did not result in any significant findings for perceived identity compatibility, sense of belonging and self-efficacy in the complete sample or in the samples split by field of study of the respondents. Even though the field of study of the role model did not have an effect in this research, it is interesting if a closer fit does have an effect. Because it is unclear to what extent the respondent identifies with a general field of study (humanities or natural science) it is unsure whether the respondent identified with the role model. There are however differences in characteristics between studies and thus an exact fit in study is

expected to have a more positive effect compared to no fit in study. More research should investigate this expectation. For now, we can conclude that a wide range of female professors could step up as possible role models. This will be further elaborated in paragraph 5.2.2.

Lastly, there was an unexpected interaction effect found that relates to the first main conclusion. Contradictory to the hypothesis, the fitted PhD condition scored significantly lower than the fitted professor and the non-fitted PhD conditions. For humanities students, even the professor from natural science scored significantly higher than de PhD student from humanities, meaning that professors should be addressed as role models rather than PhD students. These results will be further elaborated in paragraph 5.2.3.

5.2 Theoretical implications

5.2.1 Attainability

In this research, attainability was manipulated based on the progression of the role model. In the research by Rosenthal and colleagues (2013), this is defined as 'proximal outcome' (PhD student) and 'distal outcome' (professor). Both were presented as very successful in their position, but not famous as in other research (Dasgupta, 2004; Hoyt & Simon, 2011; Latu et al., 2013). As it is the first step after completing a master degree it was expected that the respondent could identify herself more with, the more attainable, PhD student role model.

First, a possible explanation for the fact that the PhD profile scored lower on perceived identity compatibility and sense of belonging, is that the PhD profile could be perceived as more threatening than the professor (Latu et al., 2013). The number of male and female PhD students is since 2017 equally divided (de Jonge, 2018). Comparing yourself, as a woman, with a female PhD student is not very unique anymore. Being presented with an excellent PhD student may be very confronting, highlighting the fact that you are not one of them. When you are outperformed by a peer it is likely you will engage defensive thoughts. So instead of a PhD being attainable, the success can be seen as unattainable when the role model is a peer and her success already unreachable. Her success is so extreme that it is beyond the person's grasp. In short, the role model's success highlights one's own failures and shortcomings (Lockwood & Kunda, 1997). When the success of the PhD is no longer obtainable the effect of the role model shifts from inspiring to deflating (Hoyt, 2012).

A second possible explanation for this result is related to the professor condition. Both role models were intended to have relative attainable properties and have a real position at the University of Twente. Comparing this with previous research where the high-level role models were often famous leaders or famous scientists, the role models in this research are a lot more attainable (Asgari, 2011; Dasgupta, 2004; Hoyt, 2012; Latu et al., 2013). Not only did the professor profile not have deflating effects, but it had a significant positive effect on perceived identity compatibility and sense of belonging compared to the PhD profile. Even though the professor could enhance the realization that the respondent is currently less successful than the role model, this is accompanied by the belief that the success is attainable in the future, what may explain the positive results (Hoyt, 2012). This explanation is supported by research from Gibson (2004). Individuals at relatively low levels who want to advance tend to focus on role models at higher positions rather than their peers. When they reached a level where further progression is unlikely they move back to their peers to seek new ways of improving at their current position (Gibson, 2004).

Looking at the data per field of study, attainability only had a significant positive effect on the humanities students' sense of belonging. Humanities students felt more like they belong in their major after seeing a professor profile compared to the profile of a PhD student, whereas there was no significant change for any of the natural science students. A possible explanation for the results in the group of humanities students is that the humanities is characterized as very individualistic and hierarchical, managing to become a professor is admirable (Van den Brink & Benschop, 2011). Because there are little female professors in humanities compared to the number of female students, seeing a female professor may increase their sense of belonging in their major (Universiteit Twente, 2010). Seeing a female professor resembles women being represented in the complete career ladder. In research by Dasgupta (2004), students who encountered mostly male faculty members showed an increase in gender stereotypes about women. The opposite was the case for women at a women's college who saw mostly women. Supporting the results from this study that seeing women in high positions is believing that you can do it too, humanities students sense of belonging was higher for the professor condition compared to the PhD condition (Dasgupta, 2004).

For the natural science students, the position of the role model made no difference on the dependent variables. It is unsure if both worked or both did not because there was no control group. Both profiles scored higher than the midpoint of the scale for inspirational, but we cannot be sure if this is caused by the role model alone. In the natural sciences, professional capital is highly valued. The number of publications, research projects, and congress presentations are very important (Van den Brink & Benschop, 2011). The profiles were written, so that each profile was relatively equally successful. For each accomplishment for the PhD student, there was an equivalent for the professor profile. Because it is social capital that is highly valued, it does not matter how far you are progressed when your achievements are relevant. Becoming a professor seems attainable for natural science students because it seems objective, based on achievements and on hard work (Brint et al., 2008).

5.2.2 Similarity

In this research field of study had no effect on the dependent variables. This could be because the respondent could already identify with the role model by means of gender and educational institution. Research shows that successful individuals are more likely to become personal role models when they possess similar traits and the student can identify with the role model (Dasgupta, 2011, Marx & Roman, 2002). Additionally, other research shows that a dissimilarity in study had negative effect on respondents (Lockwood & Kunda, 1997; Asgari et al., 2011). However, in this study each of the four role models was already on a certain level similar to the respondent and no differences between conditions were found. The similarity in gender and background university of the role model could have countered the possible negative effects of dissimilarity in field of study as expected by previous research. For now, we can conclude that field of study does not have a effect on students perceived identity compatibility, sense of belonging and self-efficacy. This means that role models of a wide range of studies can be used, when they are from the same gender and educational institution, without having negative effects on the dependent variables.

5.2.3 Interaction effects

The two factors, attainability and similarity, combined had an unexpected result. In total four profiles of proposed role models were tested. A PhD student in the humanities, a PhD student in natural science, a professor in the humanities and a professor in the natural science. In line with previous

research, a PhD with the same fit was hypothesized as the role model that would positively affect the sense of belonging, perceived identity compatibility and self-efficacy. In this research, only interaction effects were found for the dependent variable sense of belonging. Contradictory to the hypothesis, a PhD student with a fit in field of study scored significantly lower than the professor from with a fit in field of study and a PhD student from a different field.

When the data file was split based on the field of study of the respondents, no effects were found for the natural science students. For the humanities students, the same hypothesis was rejected. In this case, the other three profiles all scored significantly higher than the PhD with a fit in field of study on the dependent variables.

For the complete sample of respondents these results, that a PhD from a different field of study scores higher than the hypothesized PhD with a fit in field of study, are interesting. An additional explanation, other than the one mentioned before, is that a no-fit PhD student is perceived as an inspiration, more than a threat. She is a high achieving peer, but her results are not threatening because she is active in a different field of study compared to what the student herself is active in. For the sample of humanities students, the fitted PhD profile also scored significantly lower than the not-fitted professor profile. This could be because in general professors scored higher among humanities students because of their admirable position.

5.3 Practical implications

In this research, the professor profiles scored significantly higher on perceived identity compatibility and sense of belonging. This means that professors could be used as role models for future female researchers. Combined with the findings that in general, the fit of a role model does not have an effect on students, role models could be used more efficiently in science. The university can make use of their own female professors to inspire their students to stay in science without being afraid of a deflating effect by projecting a woman from a different field of study. Role models do not have to be limited to their own field of study and do not necessarily need to be famous. Which results in a bigger pool of potentially suitable role models in science. Professors from different fields of study can support each other in their role model function. It is known behaviour for women who reached the top of the career ladder to set themselves apart from other women ‘I am an exception’. This called ‘Queen Bee’ behaviour can be countered by presenting more female role models from several fields of study, showing that they are in fact not the ‘exception’ as this research supports (Derks, Ellemers, van Laar & de Groot, 2011).

5.4 Limitations

Despite the strong commitment towards this research, some limitations came up during the process. These limitations will be further explained in the next paragraph as they might have influenced the results of this study.

First, a manipulation check for the variables attainability and similarity was not included in the final experiment. It was included in the pre-test. At that time there was no doubt about the manipulation and thus it was not included in the final experiment. However, the results were different from what was hypothesized and therefore it would be interesting to see at what level the respondents perceived the profiles as attainable.

Second, the goal of this research was to compare two fields of study, however, a general study had to be picked to be represented by the role model. Fit with the role model was assumed when the student was enrolled in a study from the same field as the role model. Because of this, there was still a certain discrepancy between the field of study of the respondent in combination with the role model. It is possible that students identify more with their exact study than their field of study and that therefore no results were found. The similarity could have been more explicit by presenting the student a role model from exact the same study or a study exactly opposite from their own (by conducting a pre-test in which 'opposite' is defined'). Because it is unclear if respondents identified with the general academic field, it is unsure if both conditions had an effect or both did not have an effect on the respondents. For both of the above limitations, a manipulation check should be included when conducting further research.

Last, by not including a control group only the differences between the profiles could be investigated not the effects of the role models in general. It is therefore unsure if the role models had a significant effect compared to respondents who did not see a profile. Even tough previous research showed positive effects for role models it is unsure if the role models in this research had an effect other than a difference between conditions. The mean scores of each dependent variable were higher than the midpoints of the scale which may indicate the positive effect of the role models. This indication cannot be made sure, therefore a control condition should be included when conducting further research.

5.5 Conclusion

A professor role model strengthens the feeling of 'She is a woman, I am a woman. She does great things, I could do great things' (Morgenroth, Ryan & Peters, 2015). This mechanism does not concern 'learning how to' from a role model but rather sends a message that it is possible to achieve certain goals or positions. An individual who is not successful enough is not seen as a role model, but a too successful role model may seem unattainable. As a result, the student may contrast herself from the proposed role model. What is seen as 'successful' is dependent on the respondent, in this case, female students. In this research, the profile of the professor was seen as successful, attainable and showed significantly higher results for perceived identity compatibility and sense of belonging than the PhD condition (Morgenroth et al., 2015).

Field of study is not a factor with which the effects of a role model can be increased. However, for students in general, but humanities students specific, the position of the role model has a positive effect on their perceived identity compatibility and sense of belonging. Meaning that for these students a professor is a more effective role model than a PhD student.

This increase in sense of belonging and perceived identity compatibility are believed to have a positive effect on women's engagement in their field, their self-confidence, commitment and retention in their field of study (Rosenthal et al., 2013; Shin et al., 2016). Even though we cannot say that a role model has a direct effect on interest in becoming a professor. The indirect effect makes us believe that using professors as role models for female students will increase the number of students who would like to pursue a career in science. Matilda, from the children's book by Ellie Irving, wants to be a scientist. She only needs a role model that makes her feel likes she belongs in science.

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Appendices

Appendix A: Pre-test Procedure

Pre-test pictures

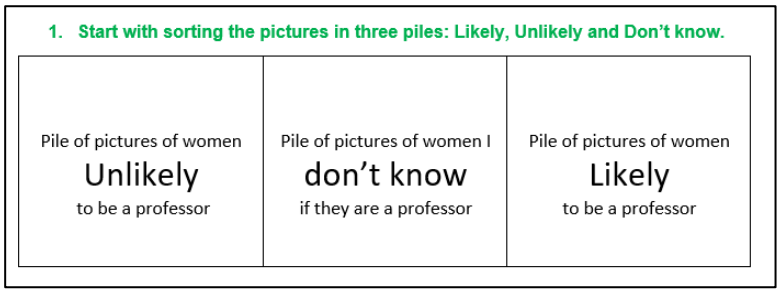
Randomly 17 female students were selected from both natural Science and humanities studies. Each participant was randomly selected to complete two Q-sorts (humanities and natural science profile) for the high or low attainable condition.

Half of the respondents started with imagining the women in the pictures to be working in humanities and then, after completing the first Q-sort, in natural science. The other half of the respondents completed first the Q-sort for natural science and then humanities.

|figure 6: *preliminary study pictures for PhD student profile*

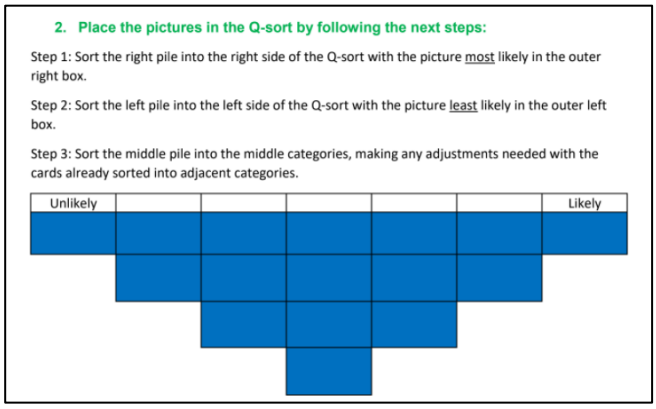
|figure 7: *preliminary study picures for Professor profile*

Each student is asked to arrange 16 pictures of women (proposed PhD student or professor) into three piles. A pile with pictures unlikely to be a PhD student/Professor, a pile of pictures the respondent was not sure, and a pile of pictures of women likely to be a PhD student/Professor.



|figure 8: *Sorting image preliminary study*

Then, starting with the 'Likely' pile, then 'Unlikely' and lastly 'Don't Know', the pictures were placed in a Q-sort.



|figure 9: *Preliminary study instruction for Q-sort*

The picture placed in the outer left column received -3 points working up to the outer right column which received +3 points.

|figure 10: Preliminary study example of a Q-sort

The six pictures placed on the outer right of the Q-sort were used in the second part of the pre-test. For each of the pictures the respondent answered one question and four statements.

1. What is this woman's age?

1. This woman is a good representative for her occupation
2. This woman is likeable
3. This woman is competent
4. The position of this woman is attainable for me

Pre-test Profiles

Participants randomly read one profile namely humanities + PhD, humanities + professor, natural science + PhD and natural science + professor. After reading the profile respondents were asked to answer three questions on a five-point scale from 'not at all' to 'completely':

1. How similar do you think you are to the person you read about?
2. Overall, how relevant is this profile to you?
3. How inspirational is this profile to you?

Appendix B: Pre-test profiles

Natural science – PhD

Looking at PhD student Denise Altena's resume, you can see a story of a Chemistry student. MSc. Altena finished her Masters (cum laude) in Chemistry in 2016 at the University of Twente. During her masters, she visited The University of California, Berkeley for three months before starting a position as a PhD student at The University of Twente, at the Department of Molecular Nanofabrication where she received a PhD research grant. During the first two years of her PhD research, MSc. Altena research focused on Nano Chemistry. Since 2017 she is teaching as a PhD and since 2018 she supervises students in projects and thesis writing at the Department of Molecular Nanofabrication at the University of Twente, the Netherlands. For her master thesis, she received the Best Thesis Award in 2016.

MSc. Altena's research tries to improve molecular life. She sometimes calls her research ”bio-inspired molecular engineering”. She tries to develop bioactive and dynamic systems.

She has lectured undergraduate and some graduate level courses and her research is primarily multi-disciplinary, innovative and driven by an infinite curiosity. Her research is published in national and international reports and scientific journals like Nano Today and Journal of Nanoscience and Nanotechnology. She has travelled with her supervisor to present papers at leading international academic conferences. Before starting her masters, she was part of the board of her student association and during her masters, she has been a student assistant in several bachelor courses.

She very much enjoys science and hopes to inspire students to stay in science as well.

Humanities – PhD

Looking at PhD student Denise Altena's resume, you can see a story of a successful student. MSc. Altena finished her Masters (cum laude) in Psychology in 2016 at the University of Twente. During her masters, she visited The University of California, Berkeley for three months before starting a position as a PhD student at The University of Twente, at the Department of Psychology Health and Technology where she received a PhD research grant. During the first two years of her PhD research, MSc. Altena's research focused on mental health. Since 2017 she is teaching as a PhD student, and since 2018 she supervises students in projects and thesis writing at the Department of Psychology Health and Technology at the University of Twente, the Netherlands. For her master thesis, she received the Best Thesis Award in 2016.

MSc. Altena's research tries to improve interventions aiming at enhancing resilience and well-being and reducing distress based on positive psychology, acceptance and commitment therapy and compassion focused therapy.

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She very much enjoys science and hopes to inspire students to stay in science as well.

Humanities – professor

Looking at Professor Denise Altena' resume, you can see a story of a successful and respected scientist. Prof. Altena obtained her PhD (cum laude) in Psychology in 2003 at the University of Twente. After working at The University of California, Berkeley, she switched to the department of Psychology Health and Technology at the University of Twente where she received a postdoc research grant. During those years, Prof. Altena' research predominantly focused on Mental Health. Since 2005 she worked as an associate professor and since 2011 as a full professor at the Department of Psychology Health and Technology at the University of Twente, the Netherlands. In 2016 she received the 'Best Article Award'.

Prof. Altena has lectured extensively undergraduate, graduate and executive level courses. Her research is primarily multi-disciplinary, Innovative and driven by an infinite curiosity. She published in national and international books, reports and scientific journals like Trends in Cognitive Sciences and Health Psychology. Prof. Altena has supervised a large number of MSc and PhD thesis students and travelled worldwide with her students to present papers at leading international academic conferences.

Prof. Altena' research tries to improve interventions aiming at enhancing resilience and well-being and reducing distress based on positive psychology, acceptance and commitment therapy and compassion focused therapy.

Her research performance is summarized as (co)-authoring in more than 80 international journals and book chapters publications (since 2000). She was editor of several books, is a frequent lecturer and trainer for Psychology professionals, and serves on a number of review and policy committees where she aims to put theoretical expertise into effective practice, such as the Supervisory Board of the Psychiatry museum Dolhuys and encouraging interdisciplinary research as a member of the Young Academy (KNAW).

She very much enjoys science and hopes to inspire young scientists to aspire a career as a professor as well.

Natural science – professor

Looking at Professor Denise Altena' resume, you can see a story of a successful and respected scientist. Prof. Altena obtained her PhD (cum laude) in Chemistry in 2003 at the University of Twente. After working at The University of California, Berkeley, she switched to the Department of Molecular Nanofabrication at the University of Twente where she received a postdoc research grant. During those years, Prof. Altena' research predominantly focused on Nano chemistry. Since 2005 she worked as an associate professor and since 2011 as a full professor at the Department of Molecular Nanofabrication at the University of Twente, the Netherlands. In 2016 she received the Best Article Award.

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She very much enjoys science and hopes to inspire young scientists to aspire a career as a professor as well.

Appendix C: Pre-test results

Table 9:
One-sample t-test results pre-test profiles

	n = 17			
	M	SD	t	p
Similar, PhD profile	3.18	.951	0.77	.455
Relevant, PhD profile	2.94	.966	-.25	.805
Inspiring, PhD profile	4.06	.659	6.63	<.001*
Similar, Professor	2.35	.931	-2.86	.011*
Relevant, Professor	2.82	.809	-.90	.382
Inspiring, Professor	3.76	.752	4.19	.001*

Note. (*) Indicates a significant result.

Table 10:
Age results pre-test pictures

	M	n	*SD*
PhD picture 2	29.00	8	4.17
PhD picture 4	29.33	6	2.66
PhD picture 10	28.86	7	3.09
Professor picture 3	45.75	8	3.37
Professor picture 9	50.00	6	4.20
Professor picture 13	47.75	8	3.58

Note. n=number of respondents.

Table 11:

Results independent t-test preliminary test photos

	PhD (n=8)				Professor (n=8)			
	M	*p*	*SD*	*t*	M	*p*	*SD*	*t*
Representing	4.50	<.001*	.54	7.94	4.13	.007*	.84	3.81
Likeability	4.25	.002*	.71	5.00	4.29	.004*	.76	4.50
Competence	4.38	<.001*	.52	7.51	4.63	<.001*	.52	8.88
Attainability	3.13	.802	1.36	0.26	2.38	.250	1.41	-1.26

Note. (*) Indicates a significant difference from the midpoint of a five-point Likert scale

Appendix D: Questionnaire main study

Experiment People.utwente.nl

Start of Block: Welcome

Q1 Thank you for helping me with my research by participating in this questionnaire. First, I will ask you a few demographic questions. Then you will read a short profile of one of the employees of the University of Twente. This profile is written for the people.utwente.nl page where you can look up every employee of this university to get in contact with him or her. Pay close attention to the profile as I am interested in your opinion about the writing style and information that is given. Last, you will be asked to answer a few questions about your feelings towards your study.
Participating in this research is voluntary and you can stop at any given time if you would no longer want to participate. All results will be processed anonymously. If you have any questions, please ask. You can contact me through E-mail: h.harmsen@student.utwente.nl

- ○ I have read, and I agree with, the aforementioned text (1)
- ○ I do **not** agree with the aforementioned text and will **not** participate in this research (2)

End of Block: Welcome

Start of Block: Demographics

Q2 in what part of the world did you grow up?

- ○ Europe (1)
- ○ Asia (2)
- ○ Africa (3)
- ○ North America (4)
- ○ South America (5)
- ○ Antarctica (6)
- ○ Australia (7)

Q3 How long have you been living in Europe?

- ○ Less than 1 year (1)
- ○ More than 1, less than 5 years (2)
- ○ More than 5 years (3)

Q4 What do you study?

- ○ Bachelor, namely: (1) _____
- ○ Pre-master, namely: (2) _____
- ○ Master, namely: (3) _____

Skip To: 7 If What do you study? = Bachelor, namely:
Skip To: 7 If What do you study? = Pre-master, namely:
Skip To: 5 If What do you study? = Master, namely:

Q5 When did you start with your master?
MM/JJJJ

Q6 When do you expect to finish your master?
MM/JJJJ

Q7 What is your age?

- ○ Under 21 (1)
- ○ 21 (2)
- ○ 22 (3)
- ○ 23 (4)
- ○ 24 (5)
- ○ 25 (6)
- ○ 26 or older (7)

End of Block: Demographics

Start of Block: Motivation

Q8 Please give your opinion about the following statements, **In my study program....:**

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
I prefer course material that really challenges me, so I can learn new things	○	○	○	○	○
I prefer course material that arouses my curiosity, even if it's difficult to learn	○	○	○	○	○
the most satisfying thing for me is trying to understand the content as thoroughly as possible	○	○	○	○	○
I choose course assignments that I can learn from even if they don't guarantee a good grade	○	○	○	○	○

Q9 My grades, compared with my classmates, are:

- ○ Far below average (1)
- ○ Somewhat below average (2)
- ○ Average (3)
- ○ Somewhat above average (4)
- ○ Far above average (5)

Q10 How likely is it that you will pursue a career in science?

- ○ Extremely unlikely (1)
- ○ Somewhat unlikely (2)
- ○ Neither likely nor unlikely (3)
- ○ Somewhat likely (4)
- ○ Extremely likely (5)

11 Please give your opinion about these statements:

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
Being a researcher suggests more advantages than disadvantages to me	○	○	○	○	○
A career in science is attractive to me	○	○	○	○	○
If I had the opportunity, I would become a researcher	○	○	○	○	○
Being a researcher would bring me great satisfaction	○	○	○	○	○

End of Block: Motivation

Start of Block: Profiles

Q12.1 Please read the following profile very carefully, after reading you will be asked to answer a few questions about the writing style. You won't be able to go back to the profile after you clicked the 'next' button.

About me | Research | Contact

Looking at Ph.D. student Denise Altena's resume, you can see a story of a successful student. MSc. Altena finished her Masters (cum laude) in Psychology in 2016 at the University of Twente. During her masters, she visited The University of California, Berkeley for three months before starting a position as a Ph.D. student at The University of Twente, at the Department of Psychology Health and Technology where she received a Ph.D. research grant. During the first two years of her Ph.D. research, MSc. Altena's research focused on mental health. Since 2017 she is teaching as a Ph.D'er and since 2018 she supervises students in projects and thesis writing at the Department of Psychology Health and Technology at the University of Twente, the Netherlands. For her master thesis, she received the Best Thesis Award in 2016.

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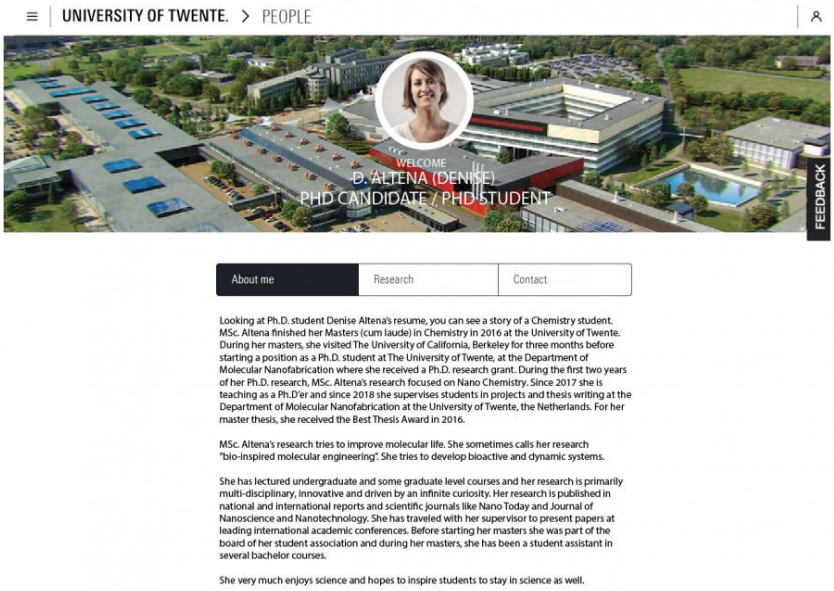
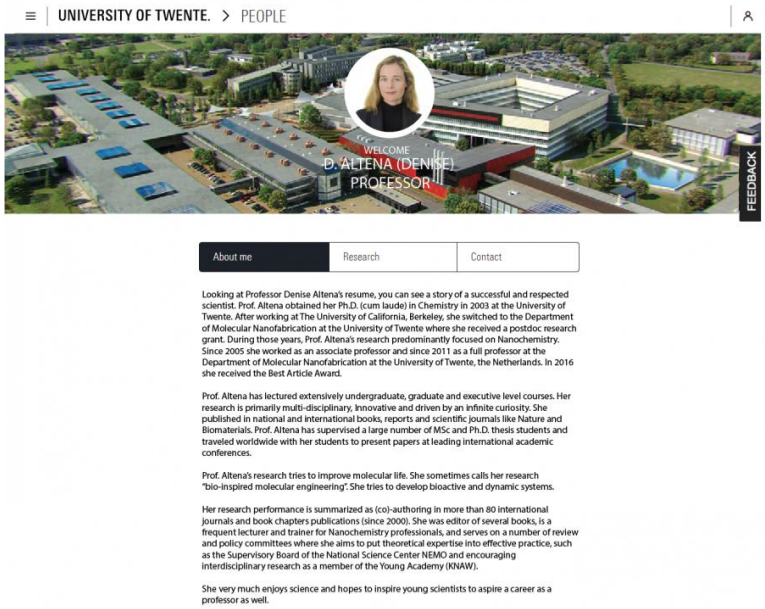
She has lectured undergraduate and some graduate level courses and her research is primarily multi-disciplinary, innovative and driven by an infinite curiosity. Her research is published in national and international reports and scientific journals like Depression and Anxiety and Journal of Anxiety disorders. She has traveled with her supervisor to present papers at leading international academic conferences. Before starting her masters, she was part of the board of her student association and during her masters, she has been a student assistant in several bachelor courses.

She very much enjoys science and hopes to inspire students to stay in science as well.

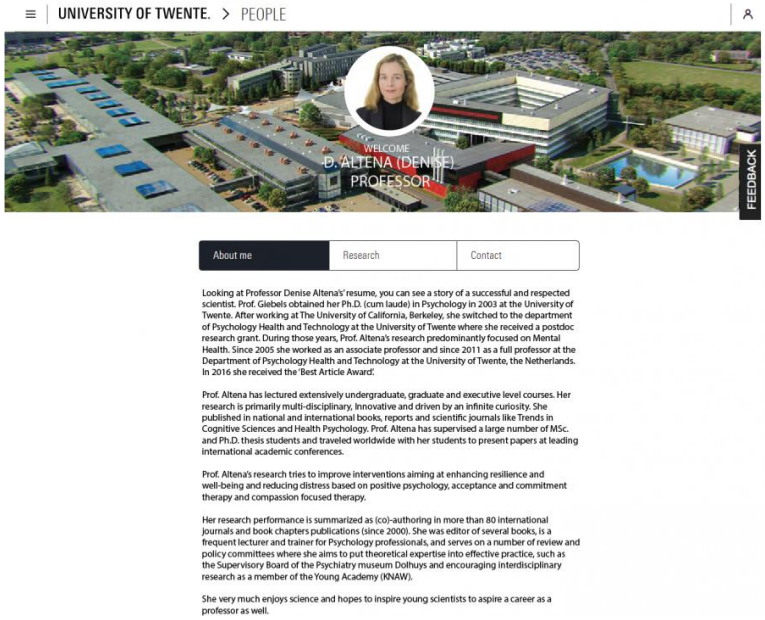
Q12.2 Please read the following profile very carefully, after reading you will be asked to answer a few questions about the writing style. You won't be able to go back to the profile after you clicked the 'next' button.



Q12.3 Please read the following profile very carefully, after reading you will be asked to answer a few questions about the writing style. You won't be able to go back to the profile after you clicked the 'next' button.



Q12.4 Please read the following profile very carefully, after reading you will be asked to answer a few questions about the writing style. You won't be able to go back to the profile after you clicked the 'next' button.



End of Block: Profiles

Start of Block: Writing style - Randomization control + Role model effectiveness

Q13 How would you rate the writing style of the profile you just read?

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	
Not at all inspiring	○	○	○	○	○	Very inspiring
Easy to read	○	○	○	○	○	Hard to read
Very informative	○	○	○	○	○	Not at all informative
Very entertaining	○	○	○	○	○	Not at all entertaining

Q14 Rate the following questions on a scale from 1-5 for the person you read about compared to you?

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	
Not at all similar	○	○	○	○	○	Completely similar
Not at all relevant	○	○	○	○	○	Completely relevant
Completely inspiring	○	○	○	○	○	Not at all inspiring

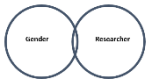
End of Block: Writing style - Randomization control + Role model effectiveness

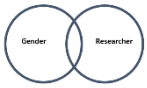
Start of Block: Perceived Identity Compatibility

Q15 Please look carefully at these pictures and then answer the question below.

Which of the 7 pictures describes best how compatible you think your gender is with being a researcher?

○ 1. 

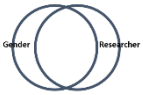
○ 2. 

○ 3. 

○ 4. 

○ 5. 

○ 6. 

○ 7. 

End of Block: Perceived Identity Compatibility

Start of Block: Sense of belonging

Q16 For the next set of questions, we would like you to think specifically about your study program.

Please choose a bullet that best describes **how you feel about your study** (including your department and your classes in that department).

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	
Thrilled	○	○	○	○	○	Miserable
Definitely fit in	○	○	○	○	○	Do not fit in
I feel very welcome	○	○	○	○	○	I do not feel welcome
Very comfortable	○	○	○	○	○	Not comfortable

Q17 Please select the bullet that best describes your **feelings towards your peers and classmates** in your study?

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	
I like my peers and classmates	○	○	○	○	○	I do not like my peers and classmates
I feel very comfortable with them	○	○	○	○	○	I do not feel comfortable with them

Q18 Please select the bullet that best describes your **feelings towards your teachers and professors** in your study?

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	
I like my teachers and professors	○	○	○	○	○	I do not like my teachers and professors
I feel very comfortable with them	○	○	○	○	○	I do not feel comfortable with them

End of Block: Sense of belonging

Start of Block: Self-efficacy

Q19 Please answer the following statements:

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
I believe I will receive an excellent score in my study program	○	○	○	○	○
I'm certain I can understand difficult material part of my study program	○	○	○	○	○
I'm confident I can understand basic concepts part of my study program	○	○	○	○	○
I'm confident I can understand the most complex material part of my study program	○	○	○	○	○
I'm confident I can do an excellent job in meeting the goals of my study program	○	○	○	○	○
I expect to do well learning during my study program	○	○	○	○	○
I'm certain I can master the material part of my study program	○	○	○	○	○
Considering the difficulty of the material of my study program, the learning context, and my skills, I think I will do well	○	○	○	○	○

End of Block: Self-efficacy

Start of Block: Interest in career in Science

Q20 How interested are you in pursuing a PhD in your field of study?

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	
Not at all interested	○	○	○	○	○	Very interested

Q21 How interested are you in pursuing a career as a professor in your field of study?

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	
Not at all interested	○	○	○	○	○	Very interested

End of Block: Interest in career in Science

Start of Block: End of survey

Q22 What was the position of the person you read about?

- ○ Professor (1)
- ○ PhD Student (2)

Q23 in what field of study was the person you read about active?

- ○ Social Sciences (1)
- ○ Natural Sciences (2)

Q24 How did you come to this survey?

- ○ After clicking on a link (1)
- ○ At the request of the researcher in person (2)
- ○ By a flyer (3)

Q25 Would you like to receive the results of this research? Please leave your e-mail address

- ○ No (1)
- ○ Yes, (2) _____

Q26 If you have any questions or remarks you can leave them here:

_____

End of Block: End of survey

Appendix E: Study distribution respondents main study

Table 12:
Study distribution

	Bachelor		Master		Total	
Name study	N	%	N	%	N	%
Advanced Technology	2	1,0	0	0	2	1,0
Applied Mathematics	5	2,4	5	2,4	10	4,8
Applied Physics	0	0	5	2,4	5	2,4
ATLAS	1	0,5	0	0	1	0,5
Biomedical Engineering	7	3,3	15	7,1	22	10,4
Business Administration	1	0,5	3	1,4	4	1,9
Business Information Technology	1	0,5	1	0,5	2	1,0
Chemical Engineering	0	0	4	1,9	4	1,9
Civil Engineering (and management)	3	1,4	2	1,0	5	2,4
Communication Science	5	2,4	3	1,4	8	3,8
Computer Science	5	2,4	2	1,0	7	3,4
Construction Management Engineering	0	0	2	1,0	2	1,0
Creative Technology	4	1,9	0	0	4	1,9
Educational Science and Technology	0	0	35	16,7	35	16,7
Electrical Engineering	1	0,5	1	0,5	2	1,0
Embedded systems	0	0	1	0,5	1	0,5
European Public Administration	3	1,4	0	0	3	1,4
Health Sciences	2	1,0	10	4,8	12	5,8
Industrial Design (Engineering)	6	2,9	13	6,2	19	9,1
International Business Administration	2	1,0	0	0	2	1,0
Master of Management	0	0	1	0,5	1	0,5
Psychology	9	4,3	5	2,4	11	6,7
Science Education and Communication	0	0	1	0,5	1	0,5
Sustainable Energy Technology	0	0	3	1,4	3	1,4
Technical Medicine	12	5,7	9	4,3	21	10

Appendix F: Results MANOVA

Table 13:

Means and Standard Deviations of the three MANOVAs

	Attainability Professor			Attainability PhD			Similarity Fit			Similarity No-fit			Professor + Fit			Professor + No-fit			PhD + Fit			PhD + No-fit		
	M	SD	n	M	SD	n	M	SD	n	M	SD	n	M	SD	n	M	SD	n	M	SD	n	M	SD	n
Comp.																								
PIC	5.56	1.86	108	4.99	1.83	102	5.44	1.83	108	5.13	1.89	102	5.73	1.76	59	5.37	1.97	49	5.08	1.86	49	4.91	1.81	53
SoB	4.14	0.51	108	3.99	0.64	102	4.01	0.65	108	4.12	0.49	102	4.18	0.56	59	4.09	0.44	49	3.82	0.70	49	4.14	0.54	53
SE	3.97	0.59	108	4.01	0.59	102	4.03	0.53	108	3.94	0.64	102	4.03	0.48	59	3.90	0.69	49	4.03	0.59	49	3.99	0.60	53
Nat.																								
PIC	5.42	1.76	62	4.89	1.95	57	5.27	1.96	63	5.05	1.76	56	5.43	1.91	35	5.41	1.58	27	5.07	2.04	28	4.72	1.88	29
SoB	4.12	0.49	62	4.11	0.51	57	4.11	0.55	63	4.13	0.46	56	4.17	0.54	35	4.06	0.42	27	4.03	0.57	28	4.18	0.50	29
SE	3.94	0.61	62	3.98	0.61	57	3.99	0.56	63	3.92	0.66	56	4.01	0.47	35	3.83	0.75	27	3.96	0.66	28	4.00	0.55	29
Hum.																								
PIC	5.76	1.98	46	5.11	1.68	45	5.67	1.61	45	5.22	2.05	46	6.17	1.44	24	5.32	2.40	22	5.10	1.64	21	5.12	1.73	24
SoB	4.16	0.54	46	3.83	0.73	45	3.88	0.75	45	4.11	0.54	46	4.19	0.59	24	4.13	0.48	22	3.53	0.77	21	4.10	0.59	24
SE	4.01	0.55	46	4.04	0.58	45	4.08	0.48	45	3.97	0.56	46	4.05	0.50	24	3.98	0.61	22	4.13	0.46	21	3.96	0.66	24

Note. PIC = Perceived Identity Compatibility. SoB = Sense of Belonging. SE = Self-efficacy. Comp. = Complete sample. Nat.= Natural Science students. Hum. = Humanities students. PIC = 7-point Likert scale. SoB and SE = 5-point Likert scale.