Who do you see fulfilling a technical profession? The role of fathers' gender-stereotypical expectations in their sons' and daughters' occupational aspirations, and the role of children's gender-stereotypical beliefs as mediator in this relation

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Who do you see fulfilling a technical profession?

The role of fathers' gender-stereotypical expectations in their sons' and daughters' occupational aspirations, and the role of children's gender-stereotypical beliefs as mediator in this relation

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Abstract

Despite the fact that girls are increasingly choosing technical subjects in high school, the vast majority who practices a technical profession is men. Current research examined the relation between fathers' gendered expectations on their sons' and daughters' feminine and masculine occupational aspirations, and the role of the children's gender-stereotypical beliefs in this relation. The resulting research question concerned: To what extent are the father's gender-stereotypical expectations of professions related to his children's gender-stereotypical occupational aspirations, and to what extent do his children's gender-stereotypical beliefs about sciences mediate this relation? This question was expected to be answered by examining a sample of 100 Dutch families. Two children from each family, one aged 15 and one aged 17, participated and were asked to complete the OAT-PM and the IAT. The OAT-AM was administered to their fathers. The results showed no relations between either the father's gender-stereotypical expectations of professions and his children's gender-stereotypical beliefs about sciences, nor between the children's gender-stereotypical beliefs about sciences and their own gender-stereotypical occupational aspirations. However, it was found that the adolescent daughter's masculine occupational aspirations were higher when their father had less gender-stereotypical ideas about professions. It was concluded that future research should explore the relation between the father's implicit gender stereotypes and his children's gender-stereotypical occupational aspirations further in other social-cultural contexts, and examine the role of explicit gender stereotypes of the child as a mediator in this relation.

Keywords: children's occupational aspirations, father's gender-stereotypical expectations of professions, children's stereotypical beliefs about sciences, gender stereotypes

Introduction

In the Netherlands, professions at the highest educational level with relatively the most women can be found in the care and welfare sector and in education (e.g., doctors, psychologists, and physiotherapists) (Centraal Bureau voor de Statistiek, 2019). In 2018, more than 80% of workers in these professions were women. On the other hand, men with a high professional level comprise a great majority of 90% or more of the IT, technology and management sector. Although it can be seen that girls are increasingly opting for a technology profile in Dutch high schools, this has led to yet a minimal increase in the number of girls opting for technology in higher education (Centraal Bureau voor de Statistiek, 2018a). What is the reason that the vast majority of girls do not choose a career in technology?

One of the answers to this question could lie in the different expectations that parents have of sons and daughters, that eventually facilitate different ambitions in both their sons and daughters (Leaper, 2002). Parents can (unconsciously) convey gendered expectations to their children by tailoring their behaviour to the gender of the child they interact with. For example, research found that parents are generally more likely to give their sons more explanations on scientific content than their daughters (Kurtz-Costes et al., 2008). It has also been found that girls who show an interest in science receive less explanation – and therefore less encouragement – about this from their parents than if a boy shows the same interest (Crowley et al., 2001). Ultimately, the gendered expectations from parents may cause their children to find certain subjects more suitable for their gender than for the opposite gender, which may in turn predict their later career choice (Bleeker & Jacobs, 2004; Kurtz-Costes et al., 2008).

In this study it is hypothesized that gender stereotypes play a role in the relation between parents' expectations on the one hand, and their children's career aspirations on the other. Gender stereotypes are the structured sets of beliefs people have about personal attributes (e.g., competences, interests, and roles) of women and men (Ellemers, 2018). Gender stereotypes do not only describe the differences between women and men, but also prescribe how women and men should be(have) in various life domains. Following these gender stereotypes, research in thirty different countries has shown a clear gender segregation in occupations, with men dominating stereotypically male positions, such as policy, and women dominating stereotypically feminine positions, such as nursing (Jarman et al., 2012). Parents' gendered expectations may not play a direct role in the occupational aspirations of their children, but indirectly through the gender stereotypes that parents transmit to their children (Bleeker & Jacobs, 2004; Kurtz-Costes et al., 2008). These gender stereotypes, in turn, can influence children's aspirations for certain professions – because one profession

would be suitable for a man and the other profession would be suitable for a woman according to gender stereotypes (Leaper, 2002). All in all, the gender stereotypes children develop could explain why it is often the case that boys do and girls do not aspire a career in technology.

The research question that is central to this study concerns: To what extent are the father's gender-stereotypical expectations of professions related to his children's gender-stereotypical occupational aspirations, and to what extent do his children's gender-stereotypical beliefs about sciences mediate this relation? This question is expected to be answered by examining a sample from longitudinal family data. An answer to this question can contribute to a better understanding of the gender gap. Furthermore, insight in the way children think about sciences as appropriate for their gender may also provide further explanation of this gender gap in professions. If there is a better understanding of what plays a role in the gender gap, there can be intervened, for example by making parents aware of the influence they have on their children regarding this topic.

In conclusion, the scientific relevance of this study concerns the contribution of knowledge about the role of fathers in their children's gender stereotypes and in the gender-stereotypical preferences for occupations of their children. This research is specifically focused on the role of fathers for the reason that past research has only shown effects of mothers' gender-stereotypical expectations of sons and daughters on children's occupational aspirations (Bleeker & Jacobs, 2004). Even though research has found that fathers have an influence on the gender stereotypes their younger children develop (Leaper, 2002; Crowley et al., 2001), the potential influence of gender-stereotypical expectations of sons and daughters on their adolescent children – nor their occupational aspirations – has not yet been studied for fathers. In addition, fathers appear to have stronger gender stereotypes than mothers and fathers seem to convey these more often (Endendijk et al., 2014). Consequently, it is expected that stronger gender-stereotypical expectations of fathers are related to stronger gender-stereotypical occupational aspirations of their children.

Occupational aspirations of the father and the child

Occupational aspirations are the ideas people have about what professions they would like to have (Frome et al., 2006). According to Bandura and colleagues (2001) and Kim and colleagues (2018) people are not born with occupational aspirations but people learn about and internalize occupational aspirations through their environment. Considering that parents are the ones with whom children usually live for an average of 18 years and therefore are

referred to as being part of the child's microsystem (Bronfenbrenner & Ceci, 1994), parents most closely affect a child's development. Parents could thus exert an influence on the occupational aspirations that their children develop. These occupational aspirations can be gender-related, for instance, as described above, with the majority of health professionals being women and the majority of policy officers being men (Jarman et al., 2012). The fact that there is such a difference in numbers of men and women filling these professions is not striking, as these professions fall in other sectors, which correspond to specific gender roles (e.g., nursing is for women). Gender roles are socially shared expectations of behaviour that is typically male or female (Eagly & Karau, 2002). In research is found that only girls who feel competent enough of high school math and who perceive themselves able to fulfil a math course, are more likely to choose a major in math or a math course, which is incongruent to their gender role (Kim et al., 2018). The same goes for professions: someone's choice of profession is found to be dependent on the way he or she experiences himself suitable for a particular profession (Bleeker & Jacobs, 2004; Eccles & Wigfield, 1995; Ramaci et al., 2016).

In that regard, research shows that that the degree to which parents have expectations of their children for professions, can change their children's sense of suitability for certain professions (Leaper, 2002). As described earlier, boys are found to be more encouraged in science by their parents than girls, when they are given more explanation on this topic (Crowley et al., 2001). This increases boys' motivation and self-concept in science and lowers these for girls (Leaper, 2002). As such gender-differentiated experiences become more common in children's lives, especially those shaped by their parents, it is likely that their abilities, knowledge, expectations, and preferences are influenced. In this way, parents have a certain influence on the gender development of their child(ren), that may lead to expectancy effects with regard to the children's own academic achievements and beliefs. For example, Eccles and colleagues (2000) found that parents who endorse the stereotype that mathematics is more natural for boys than for girls, have daughters who increasingly loose confidence in their math skills. Their daughters also lowered the degree of usefulness of mathematics for their future. All in all, parents' expectations can lead to children having certain experiences and opportunities that give them the confidence and skills needed to be successful in certain professions. Ultimately, this can result in children considering those professions for themselves that their parents find suitable for them.

The interaction through which children learn about the gendered expectations of professions from their parents can be divided in three channels: implicitly through modelling and enactive behaviour, and explicitly through direct tuition (Bussey & Bandura, 1999;

Endendijk et al., 2014). Where implicit reinforcement happens mostly unconsciously (Endendijk et al., 2014), explicit reinforcement could be consciously detected and reported by the perceiver (Quadflieg & Macrae, 2011). Two forms of implicit reinforcement are first discussed below, followed by one form of explicit reinforcement.

First, according to the social cognitive theory of gender role, children learn gender-typed behaviour from their parents indirectly via modelling and observation of gender roles (e.g., father as breadwinner) (Bussey & Bandura, 1999). When fathers are predominantly occupying the role of breadwinner, it is reasonable that their sons are prepared in their experiences and education to fulfil a role that is congruent to their gender (Berenbaum et al., 2008). Despite the fact that this traditional sphere of roles in the household is becoming increasingly blurred (Centraal Bureau voor de Statistiek, 2018b), there is still little change in gender segregation in the labour market, where women dominate professions in education and the welfare sector and men dominating the management sector (Centraal Bureau voor de Statistiek, 2019; Jarman et al., 2012). Through observing their parents in certain professions (e.g., father as technician; mother as kindergarten teacher), children learn that certain professions are more suitable for a woman or a man. In the end, they develop an idea of which profession is most suitable for their gender and thus for themselves, possibly based on what they have always observed (Berenbaum et al., 2008). Hence, occupations can also be seen in the category of gender roles, which can influence the occupational aspirations of children through modelling and observation.

Second, children learn directly about gender-typed behaviour through enactive learning – that is learning-by-doing (Korosteleva, 2010). As Bussey & Bandura (1999) describe, gender-related behaviour is learned by the responses it elicits in the social environment. For instance, children are implicitly reinforced in gender-typed behaviour by their parents, when their parents talk more about negative emotions (e.g., sadness) with their daughters than their sons (Endendijk et al., 2014; Fivush et al., 2000). Along these lines, girls are encouraged to talk about their sadness and learn that sadness is an integral part of their experience, whereas boys do not learn how to cope with their sadness, nor talk about it and thereby ignore or avoid this feeling. It also appears that parents have more interpersonally situated conversations with their daughters than with their sons (Fivush et al., 2000). This explains, among other things, that girls seem to be more interpersonally concerned than boys. In their day-to-day interactions, including learning contexts and friendships, girls generally appear to be more concerned about relationships and display empathy more than boys to indicate their engagement with others (Wood & Fixmer-Oraiz, 2018). In summary, both boys

and girls implicitly acquire knowledge through enactive learning about what is and what is not appropriate behaviour for their gender. This may lead them both to develop skills that are required for professions in different sectors (e.g., women as psychologists; Centraal Bureau voor de Statistiek, 2019).

Third, children learn in a more direct and explicit way through direct tuition – that is informing people about what is and what is not appropriate behaviour per gender by generalizing information about specific modelled exemplars (Bussey & Bandura, 1999). An example of explicit reinforcement is when parents (un)consciously stimulate gender-typed behaviour that follows these gender roles by making more positive comments about images of children who engage in behaviours and activities that are appropriate for their gender (e.g., girls play with dolls; "Boys never play with dolls") when they read a picture book with their children (Endendijk et al., 2014). Taken together, these implicit and explicit reinforcements of gender-typed behaviour that parents (un)consciously enact on their children lead, for example, to women being more responsive communicators than men. Eventually, this could make women more suitable for professions in the care and welfare sector than men (Wood & Fixmer-Oraiz, 2018).

All of these conscious, unconscious, explicit and implicit interactions and reinforcements of children's behaviours, can have effects on the occupational aspirations of children. Ultimately, parents transfer their own ideas and expectations of certain professions to their children through all these interactions and reinforcements (Ginevra et al., 2015). These can, in turn, influence the occupational aspirations of their children (Bleeker & Jacobs, 2004; Leaper, 2002).

The role of gender-stereotypical beliefs

In the interaction between parents and children in which gender-typed expectations are passed on, parents' gender stereotypes – their structured sets of beliefs about personal attributes of women and men – can also be passed on to their children (Ellemers, 2018). Although this stereotype is no longer very present, current gender stereotypes are still based on the traditional idea of men as breadwinner and women as homemaker (Eagly & Karau, 2002; Ellemers et al., 2004). However, the gender-stereotypical traits of men and women associated with these traditional gender roles are still very present: men are seen as more agentic with traits such as dominance, ambition and competitiveness, while women are seen as more communal with traits such as nurturing, sensitive and emotional (Haines et al., 2016). Following these traits, some occupations are still viewed as typically male or female (e.g.,

administrative assistant is feminine; cable installer is masculine) (Haines et al., 2016). Sequentially, research has shown that there is a positive relation between the gender-stereotypical cognitions of parents and those of their children (Ramaci et al., 2017).

For mothers, research has been done on the relation between their gender stereotypes and their children's gender stereotypes. For example, in the research of Bleeker and Jacobs (2004) was found that the mothers' expectations correlated with their children's level of experienced math proficiency, it should be noted that the mothers' expectations were directly related to their own gender-stereotyped beliefs. Ergo, the gender-stereotypical ideas of the parent may play an indirect role in the transfer of occupational aspirations. About mothers is known that they have the tendency to hold their gender stereotypes more implicitly and unconsciously than fathers (Endendijk et al., 2014). This is also reflected in the way they appear to convey their gender stereotypes to their children, which is indirectly by making more positive comments about gender-congruent behaviour when reading a picture book to their children than fathers. Additionally, previous research has found that when mothers discuss past events with their children, they make more use of emotional utterances and emotion words than fathers do (Fivush et al., 2000). The relation between this indirect transfer of the maternal gender stereotypes and the occupational aspirations of her children has been established (Bleeker & Jacobs, 2004).

However, for fathers information about the relation between their gender-stereotypical occupational expectations and their older children's ideas about this is lacking (Šimunović & Babarović, 2020). Whereas the gender stereotypes of fathers are found to be more explicit than the gender stereotypes of mothers (Endendijk et al., 2013). This can be explained by the fact that it is considered less acceptable for mothers to explicitly express gender stereotypes, as opposed to fathers. In practice, for example, it can be seen that fathers discourage behaviour that is incongruent to a gender more than mothers do, when they say things like "Boys do not play with dolls" (Endendijk et al., 2014). Even though implicit stereotypes are found in similar levels in both parents (Endendijk et al., 2013). In summary, no research has yet been conducted on the relation between fathers' stronger gender stereotypes and the gender stereotypes of their adolescent children.

In addition, fathers are known to spend relatively more time with their children when they are older (Yeung et al., 2001). An effect of this has been shown in a study by McHale and colleagues (2004) in which mothers' personality qualities predicted the participation in the sex-typed activities of their children in middle childhood, while the fathers' qualities predicted the participation in sex-typed activities for children in adolescence (e.g., art – girls;

competitive sports – boys). Overall, information about the relation between the fathers' gender-stereotypical expectations of professions and their children's occupational aspirations is lacking, while fathers' gender stereotypes are more explicit than those of mothers are and fathers are more involved in the education of their adolescent children than mothers (Endendijk et al., 2014; Yeung et al., 2001).

Furthermore, children's own gender stereotypes may play a role in the relation between their fathers' expectations and their own career aspirations, because gender stereotypes are found to relate to an individual's choice of profession (Schmader et al., 2004; Song et al., 2017). The mechanism behind this concerns the stereotype threat, which is the concern that is experienced by group members that their behaviour might confirm a negative stereotype (Schmader et al., 2004; Shapiro & Aronson, 2013). For example, awareness of the negative math-gender stereotype among girls can interfere with girls performing up to their potential for math tests as well as their interests in math careers (Schmader et al., 2004). In other words: girls who believe this negative math-gender stereotype, internalize incidental behaviour and thereby confirm this stereotype in order to achieve personal acceptance (Song et al., 2017) – even if it is to their own disadvantage (Schmader et al., 2004). For professions, the same mechanism is applicable as the majority of engineers, computer scientists, and physicists are men. This makes women develop gender stereotypes that imply that there are inherent differences in ability between men and women that make men more suitable for these careers (Schmader et al., 2004). Following the stereotype threat in combination with the existing gender-stereotypical ideas of professions, children's own gender stereotypes may be a notable mediator in the expected relation between the father's gender stereotypes and his children's occupational aspirations.

Based on the information given, in current research it is expected that:

Hypothesis 1: Stronger gender-stereotypical expectations a father has of professions are related to stronger gender-stereotypical occupational aspirations of his children.

Hypothesis 2: Stronger gender-stereotypical expectations a father has of professions are related to stronger gender-stereotypical beliefs of his children about sciences.

Hypothesis 3: Stronger gender-stereotypical beliefs a child has about sciences, are related to stronger gender-stereotypical occupational aspirations of the child.

Hypothesis 4: Children's gender-stereotypical beliefs about sciences mediate the

relation between the father's gender-stereotypical expectations of professions and his children's gender-stereotypical occupational aspirations.

Methods

Design

The current study is part of a larger longitudinal research project in the Netherlands called 'Girls in Science', which has been approved by the ethics committee of the Institute of Pedagogical Sciences and an external board. The aim of this major study is to research gender socialization in the family and school context. In order not to let this goal shine through, the name "*Blik op de Toekomst*" ("A view on the future" in English) is used towards the participants during the research period from September 2017 up to September 2022. The research project consists of two waves with three samples, of which the first wave of sample 3 is used in the current study. The data of this sample was obtained in 2019 and has a multisource design in which interviews, observation tasks, and questionnaires are administered.

For this research, eligible families in the Western and Middle region of the Netherlands were selected from municipality records. The inclusion criteria for this specific wave were: a family with father, mother and at least two children; oldest born between 01-03-2001 and 31-12-2002; second child born between 01-09-2003 and 31-06-2004; age difference max. 36 months; no serious physical or psychological impairments of one of the family members; all family members should have a Dutch nationality or should speak the Dutch language; parents should not be divorced (should live on the same address). The families that met the inclusion criteria were contacted by means of a letter and a reminder. There was a 6% response rate and 14% opted out of the study, whereas the rest of the families did not respond at all. This resulted in 199 participating families.

Procedure

As described earlier, the participants were acquired through a targeted sample. They were told that the research concerned the way children view their future and the role their parents play in this. After voluntary agreement to the study, home visits of approximately 2 hours were scheduled per family at their home, which were conducted by two trained undergraduate researchers. Prior to these home visits, a questionnaire, of which the 'attitudes toward others' (attitude measures) in three domains: occupations, activities, and traits (OAT-AM; Liben et al., 2002) was a part, was sent to the parents to complete.

During the home visits, written informed consent of all family members was obtained first, and then questionnaires, computer tests and interaction tasks were administered to both the parents and both children. The interaction tasks were with each child and each parent and with the whole family. Additionally, the children had to complete the OAT-AM and the 'sex typing of self' (personal measures) of the OAT (OAT-PM; Liben et al., 2002) questionnaires on an iPad during the home visit. There was another task between the administration of these tasks. Both children were also interviewed individually. Finally, as a gift for participating in the study, each family member received 20 euros in four gift vouchers, 80 euros in total. If they chose the amount of money as compensation, they were referred to another questionnaire to fill in their bank details to ensure the privacy of the families. At the end of the research period in September 2022, all information about the objective and the results of the research will be shared with the participants.

Participants

Of the 199 families from this wave, a subsample of 100 families was used for this study. This includes both the first child n = 100 (46% male, *M*age = 17.59 years, SD = 0.50; 54% female, *M*age = 17.59 years, SD = 0.45), the second child n = 100 (36% male, *M*age = 15,57 years, SD = 0.22; 64% female, *M*age = 15.53 years, SD = 0.21), the fathers n = 100 (*M*age = 50,89 years, SD = 4.00), and mothers n = 100 (*M*age = 48.58 years, SD = 3.40).

As for the 100 fathers, 97% of them had a job, of which 28.9% in the technical sector. The percentage of mothers who work was 97%, of which 13.4% work in the technical sector. The vast majority of both fathers and mothers were highly educated (respectively 64% of fathers and 65% of mothers had completed university of applied sciences or higher).

Measurements

Father's gender-stereotypical expectations of professions

The gender-stereotypical expectations of professions of the father were measured by the OAT-AM. Specifically, the questionnaire regarding the occupation domain, called 'Who should do these jobs?', of the OAT-AM is used. Herein participants indicate for 25 professions on a 5-point Likert scale whether this profession should be done by men or women; 1 stands for "only men" and 5 stands for "only women". An example item is "Who should be an engineer?".

The questionnaire can be seen in Appendix A, including the rescored items, indicated with **R** (Liben et al., 2002). The list of professions consists of 10 masculine, 10 feminine and

5 neutral professions (indicated with ***** in Appendix B). Items with a mean score of 3.4 or lower were categorized as masculine, whereas items with a mean score of 4.6 or higher were categorized as feminine, and all in between were categorized as neutral.

To calculate the father's gender-stereotypical expectations, masculine occupations were rescored, neutral professions were excluded, and the mean score was calculated on the sum of the male and female professions (N = 20; $\bar{X} = \frac{\sum x}{N}$). A higher score on this questionnaire means the higher gender-stereotypical expectations of professions the father has. The reliability of this questionnaire was assessed using Cronbach's alpha. For current research, excellent internal consistency was found for feminine and masculine occupations (α = .909) (Cronbach, 1951).

Gender-stereotypical beliefs of the child about sciences

The gender-stereotypical beliefs of the child about sciences were measured using the gender-science Implicit Association Task (IAT; Greenwald et al., 1998; Nosek et al., 2006) in which the association strengths between the concepts *female* and *male* and the attributes *liberal arts* and *science* were measured.

The test's structure is a within-subject experiment, involving two conditions in which these four categories are paired variously. For example, in condition 1 *female* and *science* have to be categorized by the participants with one key, and *male* and *liberal arts* with the other key; in condition 2 *female* and *liberal arts* are categorized with one key and *male* and *science* with the other key.

Across all participants, the order of these conditions is randomized. The combinations *male-science* and *female-liberal arts* are seen as "stereotype congruent" conditions. The difference in average categorization time between the conditions is an indicator of how strong the association between the academic categories and gender is. Faster categorization of the "stereotype congruent" condition compared to "stereotype incongruent" is an indication of a strong association of female with liberal arts and male with science compared to the reverse. The effect size D is computed for each participant, by dividing the difference in mean reaction time between the two conditions (Greenwald et al., 2003). This results in a score between 2 and -2, with scores closer to 2 representing strong gender stereotypes (e.g., science is for males) and scores near -2 representing strong contra gender stereotypes (e.g., science is for girls).

Children's occupational aspirations

Besides the implicit gender-stereotypical ideas about sciences, the children were also asked whether they would like to do the professions themselves. This is measured in the OAT-PM, which is used in the current research as a measure of the occupational aspirations of the children.

Only the questionnaire called "What I want to be" of the occupation domain is used. Herein participants are asked on a 4-point Likert scale to what extent they would like to do the 55 professions later on; 1 stands for "not at all" and 4 stands for "very interested". An example item is "How much would you want to be a nurse?". These 55 professions also included the 25 professions that were asked in the OAT-AM of the fathers.

The list of professions consists of 26 male, 21 female and 8 neutral professions, and professions with high and low status. The questionnaire can be seen in Appendix B (Liben et al., 2002). To calculate the children's occupational aspirations, neutral professions were excluded and separate scores were computed for feminine items and masculine items. Scores for the feminine items were computed by summing the ratings of feminine items and dividing this by the total of feminine items. Scores for the masculine items were computed by summing the ratings of masculine items and dividing this by the total of masculine items. This results in a score between 0 and 4, with scores closer to 4 representing strong preference for masculine or feminine jobs and scores near 0 representing minimal or no preference.

In conclusion, a higher score on the feminine items means greater preference for feminine occupations; and a higher score on the masculine items means greater preference for masculine occupations. Regarding the reliability of this questionnaire, which was assessed with Cronbach's alpha, the OAT-PM was found to have good internal consistency for feminine and masculine occupations (α = .869 for masculine items; α = .844 for the feminine items) (Cronbach, 1951).

Descriptive statistics

Table 1 presents the correlations between the variables in the model, including the dummy variables gender of the child (0 = male, 1 = female) and place in the family of the children (0 = first born, 1 = second born). First, Table 1 shows a significant correlation between the father's gender-stereotypical expectations of professions and his children's masculine occupational aspirations, r (199) = -.179, $p < .05$. Second, Table 1 shows another significant correlation between the children's masculine and feminine occupational aspirations, r (199) = -.164, $p < .05$.

Furthermore, Table 1 shows a significant correlation between gender and the occupational aspirations of the child. Additional independent sample t tests confirm significant differences between the occupational aspirations of males and females. The average score on masculine items for boys (N = 82) was compared to the average score for girls (N = 118). The t test was significant, with boys (M = 2.270, SD = .302) reporting .447 higher, 95% CI [.350, .544], than girls (M = 1.823, SD = .367), t (198) = 9.096, p < .001, two-tailed, d = 0.342. For the feminine items, the t test was significant, with girls (M = 2.340, SD = .396) reporting .519 higher, 95% CI [-.627, -.412], than boys (M = 1.820, SD = .354), t (198) = 9.531, p < .001, two-tailed, d = 0.379. Thus, it appeared that boys, on average, had higher scores on masculine occupations than girls; and, girls had higher scores on feminine items than boys. Therefore, given the difference between gender and the children's occupational aspirations, and the expected significant gender differences in occupational aspirations, the analyses will be separated for males and females.

Since no significant correlation between the first and second born and the outcome variable (occupational aspirations) was found, the analyses will not be separated for first and second born.

Table 1

Means, standard deviations (SD) and correlations (n = 300).

	***M* (*SD*)**	**Gender child**	**First/ Second born**	**OAT AM**	**OAT PM (M)**	**OAT PM (F)**	**IAT**
Gender child (female = 1)	.590 (.493)	-					
First/Second born (second born = 1)	.500 (.501)	-.102	-				
OAT AM	3.256 (.265)	.102	-.093	-			
OAT PM (M)	2.006 (.406)	-.561***	-.026	-.179**	-		
OAT PM (F)	2.127 (.457)	.561***	-.103	.028	-.164**	-	
IAT	.284 (.382)	-.033	.302***	.016	.004	-.017	-

Note. *p < .10, **p < .05, ***p < .01

Analyses

In this study the software program Statistical Package of the Social Sciences version 27 (SPSS 27) is used to analyse the data. The independent variable (IV) was father's gender-stereotypical expectations of professions, the mediator (M) concerned the gender-stereotypical beliefs of the child about sciences and the dependent variable (DV) was children's occupational aspirations.

For all analyses related to the hypotheses below, the relation between the IV and DV as well as the IV and M, will be calculated separately for males and females.

To test hypothesis 1, in which it is expected that stronger gender-stereotypical expectations a father has of professions are related to stronger gender-stereotypical occupational aspirations of his children, four simple regression analyses were performed using father's expectations as the predictor of the occupational aspirations of his male and/or female child(ren). For males it is expected that higher scores on the OAT-AM of the father are associated with higher scores on masculine OAT-PM items and lower feminine OAT-PM items, whereas for females it is expected that higher scores on the OAT-AM of the father are associated with higher scores on feminine OAT-PM items and lower scores on masculine OAT-PM items.

To test hypothesis 2, in which it is expected that stronger gender-stereotypical expectations a father has of professions are related to stronger gender-stereotypical beliefs of his children about sciences, two simple regression analyses were performed using father's expectations as the predictor of gender-stereotypical beliefs of his male and/or female child(ren). For both males and females it is expected that higher scores on the OAT-AM of the father are associated with stronger implicit stereotypes measured with the IAT.

To test hypothesis 3, which concerns that stronger gender-stereotypical beliefs a child has about sciences are related to stronger gender-stereotypical occupational aspirations of the child, four simple regression analyses were performed using the male and female child(ren)'s gender-stereotypical beliefs as the predictor of their occupational aspirations. For males, it is expected that stronger implicit stereotypes measured with the IAT are associated with higher scores on masculine OAT-PM items and lower scores on feminine OAT-PM items. For females, it is expected that stronger implicit stereotypes measured with the IAT are associated with higher scores on feminine OAT-PM items and lower scores on masculine OAT-PM items.

In hypothesis 4, it is expected that children's gender-stereotypical beliefs about sciences mediate the relation between the father's gender-stereotypical expectations of

professions and the gender-stereotypical occupational aspirations of his children. To test hypothesis 4 a multiple regression is used. First, in order to test this mediation in hypothesis 4, there must be a significant result from hypothesis 2 (between the IV and M) (Baron & Kenny, 1986). The next step in establishing mediation is showing a significant result between the IV and DV (hypothesis 1). Lastly, there must be shown a relation between the M and DV (hypothesis 3). Thus, the M will be added to the equation as an IV. For males, it is expected that the relation between higher gender-stereotypical expectations of the father and higher scores on masculine OAT-PM items (lower scores on feminine items) vanishes when gender-stereotypical beliefs are added into the equation; higher scores on the father's OAT-AM will lead to greater scores on the child's IAT and thus on his masculine OAT-PM scores (and lower feminine OAT-PM scores). For females, it is expected that the relation between higher gender-stereotypical expectations of the father and higher scores on feminine OAT-PM items (lower scores on masculine items) vanishes when gender-stereotypical beliefs are added into the equation; higher scores on the father's OAT-AM will lead to greater scores on the child's IAT and thus on her feminine OAT-PM scores (and lower masculine OAT-PM scores).

Results

In this paragraph, the results are discussed. First, the preparatory analyses are discussed, then the testing of the hypotheses.

Checking assumptions

First, linearity was checked for the OAT-PM and OAT-AM using a scatter plot. Second, inspection of both the scatterplot of standardised residuals against standardised predicted values and the normal probability plot of standardised residuals indicated that the assumptions of normality and homoscedasticity were met. Third, the expected mean error of the regression model was calculated and zero. Forth, boxplots indicated one outlier for females, and one outlier for the fathers. Both outliers were removed. Lastly, with the Durbin-Watson was calculated whether the errors were normally distributed, which they were (males = 2.028 and females = 2.047). There were no missing values.

Second, to analyse the data from the IAT, it was concluded that both the assumption of normality and the assumption of normality of difference scores were not violated after visually inspecting the relevant histograms. One outlier was found and removed from the sample.

Occupational aspirations of the father and the child

Hypothesis 1 was tested using four simple linear regressions to predict the gender-stereotypical occupational aspirations of children based on their father's gender-stereotypical expectations of professions. The associations are tested for males and females and for feminine and masculine occupations. The results are presented in Table 2.

Table 2

Unstandardized ß to calculate the relation between the father's gender-stereotypical expectations and his children's occupational aspirations.

	Occupational Aspirations of the child	
	***ß* estimates (*SE*)**	
	Masculine	**Feminine**
Males	-0.086 (.141)	0.064 (.166)
Females	-0.270** (.130)	-0.088 (.146)

Note. *$p < .10$, **$p < .05$, ***$p < .01$

For males, their father's gender-stereotypical expectations of professions are not associated with masculine ($F(1, 80) = .372$, $p = .544$), with an R^2 of .005, nor feminine ($F(1, 80) = .149$, $p = .700$) occupational aspirations with an R^2 of .043.

For females, father's expectations are negatively associated with females' masculine occupational aspirations ($F(1, 113) = 4.344$, $p < .05$), with an R^2 of .037. For each higher score of gender-stereotypical expectations of fathers, females' masculine occupational aspirations decrease with 0.270. Indicating that daughters of fathers who hold stronger gender-stereotypical ideas about professions have less aspirations in masculine occupations than daughters of fathers with weak gender-stereotypical ideas about professions. No such effect was found for feminine occupations ($F(1, 113) = .365$, $p = .547$) with an R^2 of .003. Females' feminine occupational aspirations are not associated with their father's gender-stereotypical expectations of professions.

In all, hypothesis 1 should be rejected. Stronger gender-stereotypical expectations of the father are not related to stronger gender-stereotypical occupational aspirations of all of his children. Only for daughters of fathers is found that the father's gendered expectations are associated with his daughter's masculine occupational aspirations.

The role of gender-stereotypical beliefs

For the second hypothesis two other linear regression were used to predict the gender-stereotypical beliefs of children about sciences based on their father's gender-stereotypical expectations of professions. The results are presented in Table 3.

For males, their father's gender-stereotypical expectations of professions are not associated with their gender-stereotypical beliefs about sciences ($F(1, 79) = .547$, $p = .462$), with an R^2 of .007.

Also for females, the father's gender-stereotypical expectations of professions are not associated with their gender-stereotypical beliefs about sciences ($F(1, 114 = 2.569$, $p = .112$), with an R^2 of .022.

In all, hypothesis 2 is rejected: stronger gender-stereotypical expectations a father has of professions are not related to stronger gender-stereotypical beliefs about sciences of his children.

Table 3

Unstandardized ß to calculate the relation between father's gender-stereotypical expectations and his children's gender-stereotypical beliefs about sciences.

	Gender-stereotypical beliefs of the child about sciences
	***ß* estimates (*SE*)**
Males	-0.126 (.170)
Females	0.222 (.139)

Note. *$p < .10$, **$p < .05$, ***$p < .01$

To test the third hypothesis – the mediation analyses – four more simple linear regressions were used to predict children's gender-stereotypical occupational aspirations based on their gender-stereotypical beliefs about sciences. The results are shown in Tables 4 and 5.

For males, their gender-stereotypical beliefs about sciences are not associated with their masculine ($F(1, 79) = .211$, $p = .647$), with an R^2 of .003, nor their feminine ($F(1, 79) = .035$, $p = .852$) occupational aspirations with an R^2 of .000.

For females, again, no associations were found between their gender-stereotypical beliefs about sciences and their masculine ($F(1, 115) = .007$, $p = .934$), with an R^2 of .000, nor their feminine ($F(1, 116) = .029$, $p = .865$) occupational aspirations with an R^2 of .000.

Table 4

Mediation analysis of the masculine occupational aspirations.

	Estimate	***SE***	**95% CI**		***p***
			LL	***UL***	
Males	-0.043	0.094	-0.231	0.144	0.647
Females	-0.007	0.085	-0.176	0.162	0.934

Note. $*p < .10$, $**p < .05$, $***p < .01$

Table 5

Mediation analysis of the feminine occupational aspirations.

	Estimate	***SE***	**95% CI**		***p***
			LL	***UL***	
Males	0.020	0.110	-0.198	0.238	0.852
Females	0.016	0.095	-0.172	0.205	0.865

Note. $*p < .10$, $**p < .05$, $***p < .01$

Taken together, hypothesis 3 should be rejected: stronger gender-stereotypical beliefs a child has about sciences, are not related to stronger gender-stereotypical occupational aspirations of the child. Gender-stereotypical beliefs about sciences of children are not associated with children's masculine nor feminine occupational aspirations.

With the results from the first three hypotheses, the assumption for the mediation analysis for the fourth hypothesis could not be met. Therefore, no substantiation of the role of children's stereotypical beliefs in the relation between the father's gender-stereotypical expectations of professions and his children's gender-stereotypical occupational aspirations was found in this study. From this it is concluded that children's gender-stereotypical beliefs about sciences do not mediate the relation between the father's gender-stereotypical expectations of professions and his children's gender-stereotypical occupational aspirations. Therefore, hypothesis four should be rejected.

Discussion

The research question that was central to this study, concerned: "To what extent are the father's gender-stereotypical expectations of professions related to his children's gender-stereotypical occupational aspirations, and to what extent do his children's gender-stereotypical beliefs about sciences mediate this relation?" Subsequent hypotheses were based on the social and developmental psychological theories of children who develop their gender stereotypes implicitly and explicitly in interaction with their parents in their childhood (Bussey & Bandura, 1999; Endendijk et al., 2014), which they eventually internalize as they grow older (Kim et al., 2018; Song et al., 2017). More significantly, current research focused on the role of the father, because fathers were found to have the more explicit gender stereotypes than mothers have, and they spend more time with their children when they become adolescents (Endendijk et al., 2014; Yeung et al., 2001). It was expected that children's gender-stereotypical beliefs about sciences mediated the relation between the father's gender-stereotypical expectations of professions and his children's gender-stereotypical occupational aspirations.

First of all, results of current research show that the role of the father's gender-stereotypical expectations of professions are not related to the gender-stereotypical occupational aspirations of his child(ren), except for masculine occupational aspirations of females. In other words: the extent to which a father thinks certain professions are more suitable for a certain gender is not related to the extent to which his son aspires a feminine or masculine profession and his daughter aspires a feminine occupation. But fathers' gender-stereotypical aspirations were found to relate to the extent to which his daughter aspires a masculine occupation. Girls thus seem to be more sensitive to the gender stereotypes of their father than boys, which is in line with research by Bhanot and Jovanovic (2005). Their research shows that while boys receive more intrusive parental support with their homework, girls are more sensitive to these intrusions, especially when it comes to math. An explanation they give for this finding, corresponds to the stereotype threat that girls are less skilled in math than boys (Schmader et al., 2004), which they are reminded of when their parents intrude them when they do their math homework. The same could apply to the masculine occupational aspirations of girls when their fathers have strong gender-stereotypical expectations. For example, when a father believes and promotes that a career in mathematics is not suitable for his daughter, the math-gender stereotype is made salient. Because daughters are found to be more sensitive to this stereotype than sons and also appear to be more sensitive to their father's stereotypes, his daughter is more inclined to believe what her father

is propagating and thus may show less interest in a mathematical career (Bhanot & Jovanovic, 2005; Schmader et al., 2004).

Second, the role of implicit gender-stereotypical beliefs of the child were explored in the relation between the fathers' gender-stereotypical expectations and his children's occupational aspirations. Contrary to what was expected, father's gender-stereotypical expectations of professions were found to be unrelated to his children's gender-stereotypical beliefs about sciences. Furthermore, children's gender-stereotypical beliefs about sciences were found to be unrelated to their own gender-stereotypical occupational aspirations. Although these findings were unexpected, current findings can be explained by other research. For example, the factor mediating the relation between amount of parental support and a child's career choice, concerned the career self-efficacy of the child (Ginevra et al., 2015). The career self-efficacy of an individual is also known at the extent to which someone considers themselves capable of the tasks that come with the career (Lent et al., 2000). Other research shows that it is precisely this degree of self-efficacy that predicts the traditionality of a career choice (Bandura et al., 2001). The fact that current research has found no support for stereotypes as an explanation for the relation between the father's expectations and the career choice of his child(ren), can be argued with the fact that this other factor might explain more within this relation.

In all, the findings provide no evidence to support the research question. But these findings should be interpreted within this study's limitations. First, this study's sample is part of a country with generally high support for gender equality (Endendijk et al., 2013). Moreover, the children in this sample are part of families of relatively high socio-economic status (SES), where gender equality (in occupations) may be even stronger than in lower SES (Položki Vokić et al., 2017). Kuhn and Wolter (2019) explain in their article that in countries where gender equality is the norm, children are less likely to choose a gender-stereotypical profession. The way in which their view is shaped by the norms of their environment happens both directly through shaping adolescents' perceptions of what kind of professions there are, and indirectly through influencing their peers' occupational aspirations. The fact that only for females a relation was found between the fathers' gender-stereotypical expectations on the one hand, and his children's gender-stereotypical occupational aspirations on the other, may be explained by the findings that females coming from high SES families are more likely than males to conform to gender-stereotyped college major and occupational decisions (Leppel et al., 2001; Lily, 1994).

Second, as Kuhn and Wolter (2019) argue, gender-stereotypical occupational aspirations of children are related to various factors from the environment, which happens both directly and indirectly by, among others, peers and parents. For further research, therefore, it is important to take both into account when determining gender-stereotypical professional ambitions (Kuhn & Wolter, 2019). The ages of the children in the sample (15 and 17 years) are ages at which they still live at home, and at which they spend more time with their father than they previously did. However, the fact remains that they value their peers the most, which consists both of their friends (Kurtz-Costes et al., 2008) and their siblings (Brenøe, 2017). It is even suggested that peers may play more important roles in adolescents' socialization than parents, unless adolescents have a good relationship with their parents (Tenenbaum & Leaper, 2002). In this regard, each individual's microsystem may be constructed differently (Young, 1983). Even though parents and peers are situated in the same social environment, and thus go through the same cultural socialization, depending on the bond adolescents have with either of them, one may have more impact on their gender-stereotypical occupational aspirations and/or beliefs than the other. For boys, this might explain why no results were found: their peer group and conforming to accompanying group norms are of greater importance than those of their parents are, in comparison to girls (Heyder et al., 2021). For this reason, a control variable can be added in future research, specifically the quality of the father-child relation, in order to get a better grip on the role of fathers in combination with their children's professional ambitions.

Third, implicit stereotypes, but not explicit gender stereotypes are found to shape an individual's behaviour (Galdi et al., 2017). In current research, however, only children's stereotypes were measured implicitly with the IAT, but not their fathers', as their fathers' stereotypes were only measured explicitly with the OAT-AM. In their research, Galdi and colleagues (2017) also found no relation between fathers' explicit gender stereotypes and their children's implicit and explicit gender stereotypes. What they did find was a relation between the fathers' implicit gender stereotypes and their children's implicit and explicit gender stereotypes about math and language. They argue that not the explicit attitudes and beliefs shapes fathers' behaviour, but implicit stereotypes and beliefs do (Cameron et al., 2012; Galdi et al., 2017). Therefore, it might be that these implicit stereotypes of the father are transferred in the interaction with his children, and that his children develop gender stereotypes that converge with these implicit stereotypes of their father – and not his explicit gender stereotypes.

Fourth, explicit and implicit stereotypes are found to be unrelated sometimes (Cameron et al., 2012; Galdi et al., 2017). For example, an individual might have some implicit gender stereotypes about math and gender, but does not manifest these explicitly, but when the 'math is for boys' stereotype is made salient, girls' implicit stereotype is activated and this undermines their math performances. Where explicit gender stereotypes are found to be less resistant to change and more vulnerable for environmental factors, implicit gender stereotypes appear to be more stable over time (Passolunghi et al., 2014). Depending on the situation, explicit and implicit gender stereotypes can thus be unrelated, what might explain why no relation was found in this study between the children's gender-stereotypical beliefs and their gendered-occupational aspirations. Accordingly, an explicit mediator is recommended for further research.

While several limitations have been discussed, the current study also has strengths. First, the descriptive analyses showed that the boys in this study's sample have more masculine stereotypical occupational aspirations than the girls have, and that girls aspire gender-stereotypical feminine occupations more than boys do. Despite the relatively highly educated sample, patterns of gender role conforming occupational aspirations are still visible (Eagly & Karau, 2002). Second, the use of occupational aspirations rather than actual career choices as a measure of children's gender stereotypes of professions, is a much more valid measure, as it is not subject to external influences (e.g., employers who are not willing to offer apprenticeship to girls in male dominated occupations) (Kuhn & Wolter, 2019).

Lastly, the current study tested the role of the father in his older children's occupational development and showed that the father's expectations correlate with the adolescent daughter's masculine occupational aspirations. With these findings, interventions can be targeted on this role of fathers and create awareness among them. In this way, fathers can become more conscious of their contribution to the bigger picture, and thus give their daughters the assurance that they also belong in the technical sector. In conclusion, current research highlights the importance of this topic and gives recommendations for further research to gain more information about the prevailing gender gap in occupations. An answer to the question of why the vast majority of girls do not choose a career in the technology sector, from current research, is related to the answer to the question "How strong are her father's gender stereotypes?".

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Appendix A: OAT-AM

WIE ZOU DIT BEROEP MOETEN UITOEFENEN?	Alleen mannen	Vooral mannen, sommige vrouwen	Zowel mannen als vrouwen	Vooral vrouwen, sommige mannen	Alleen vrouwen
1. Nagelstylist	1	2	3	4	5
2. Tandarts	1	2	3	4	5
3. Model	1	2	3	4	5
4. Vrachtwagenchauffeur **R**	1	2	3	4	5
5. DJ **R**	1	2	3	4	5
6. Acteur	1	2	3	4	5
7. Burgemeester **R**	1	2	3	4	5
8. Brandweer **R**	1	2	3	4	5
9. Diëtist	1	2	3	4	5
10. Oppas	1	2	3	4	5
11. Loodgieter **R**	1	2	3	4	5
12. Dierenarts	1	2	3	4	5
13. Kapper	1	2	3	4	5
14. Topsporter	1	2	3	4	5
15. Bouwvakker **R**	1	2	3	4	5
16. Basisschoolleerkracht	1	2	3	4	5
17. Beveiliger **R**	1	2	3	4	5
18. Astronaut	1	2	3	4	5
19. Juwelier **R**	1	2	3	4	5
20. Scheepskapitein **R**	1	2	3	4	5
21. Astronaut **R**	1	2	3	4	5
22. Bioloog	1	2	3	4	5
23. Advocaat	1	2	3	4	5
24. Tandartsassistent	1	2	3	4	5
25. Bloemist	1	2	3	4	5

Note. Items 2, 6, 14, 22, and 23 are neutral professions. The rescored items (**R**) concern masculine professions, whereas the rest of the items are labelled as feminine professions.

Appendix B: Occupation items on the OAT-PM

Masculine	Feminine	Neutral
1. Soldaat*	1. Schoonmaker (huishoudelijk)	1. Arts
2. Burgemeester*	2. Model*	2. Acteur (TV)*
3. Politieagent	3. Binnenhuisarchitect	3. Advocaat*
4. Buschauffeur	4. Parfumverkoper	4. Bioloog*
5. Voetballer	5. Verloskundige	5. Journalist
6. Elektricien	6. Modeontwerper	6. Bakker
7. Conducteur	7. Kindleider	7. Dierenarts*
8. Gevangenisbewaker	8. Dolfijnentrainer	8. Topsporter*
9. DJ*	9. Kapper*	
10. Tandarts*	10. Bediening	
11. Afwasser	11. Balletdanser	
12. Loodgieter*	12. Bloemist*	
13. Brandweer*	13. Diëtist*	
14. Scheidsrechter	14. Nagelstylist*	
15. Scheepskapitein*	15. Basisschoolleerkracht*	
16. Boswachter	16. Oppas*	
17. Makelaar	17. Verpleegkundige	
18. Programmeur	18. Masseur	
19. Automonteur	19. Juwelier*	
20. Astronaut*	20. Tandartsassistent*	
21. Wiskundeleraar	21. Bibliothecaris	
22. Scheikundige		
23. Vrachtwagenchauffeur*		
24. Lasser		
25. Beveiliger*		
26. Bouwvakker*		