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Gender bias in the medical education: A qualitative study on the perspectives of medicine students on their education in Groningen, The Netherlands

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Abstract

Within the world of medicine, a gender bias exists which causes several problems for both patients and personnel. The medical education is an institution that can perpetuate this gender bias to future medical professionals. Despite previous studies exposing a gender bias in the medical education already, an in-depth understanding of student's experiences is not obtained yet. This study therefore aims to get a deeper understanding of how students themselves experience their education and its curriculum and whether they perceive their education as gender biased. Students' experiences, awareness of and beliefs regarding gender bias were investigated. Gender Order Theory and Cultural Schema Theory were used as frameworks. Semi-structured in-depth interviews were conducted with twelve medicine students currently studying at the University of Groningen, with an equal division of male and female participants from different study years. Findings showed that participants feel that their education is gender biased, several reasons contributed to this. First, they felt there was a lack of information sharing on gender differences. Secondly, they felt there was a lack recognition of the problem of gender bias. Third, gender biased attitudes in a hospital context from both patients and medical professionals were perceived to be mostly directed towards women. Lastly, students lacked confidence in their abilities to treat female patients equally as male patients. Based on the findings, the medical training programs at the University of Groningen and beyond are advised to look critically at the incorporation of sex and gender-based information in their curriculum as students currently feel that they lack knowledge on this topic. A cultural shift is required in order to ensure that all patients receive the healthcare and treatment they need.

Keywords: medical education, gender bias, medicine students, gender differences, medical curriculum, qualitative research, medicine, gender order, health inequalities

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NOS	Nederlandse Omroep Stichting (Dutch Broadcasting Foundation)
UMCG	University Medical Centre Groningen
WHO	World Health Organisation
EIGE	European Institute for Gender Equality
DES	Diethylstilbesterol
FDA	Food and Drug Administration

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1. Introduction

1.1 Problem statement and background

In recent years, several news articles have been published in The Netherlands on differences in health and healthcare between men and women, with titles such as: "*Women in The Netherlands often receive the wrong medical diagnosis because healthcare is based on the male body"* (NOS, 2022; Ballering et al., 2022). Or: "*A lot of Dutch cardiologists have little knowledge of the women's heart*" (NOS, 2018; Maas, 2015). Lastly: "*Dutch medical professionals have too little knowledge of the female body in general"* (NOS, 2015; ZonMw, 2015). These headlines depict the problem of a gender bias in the world of medicine in The Netherlands. Gender bias refers to the unintended but consistent neglect of women and preconceptions based on stereotypes about their health, behaviour and experiences (Hamberg, 2008). Gender bias is closely related to gender blindness, which means that gender is not taken into account when relevant (Verdonk et al., 2009). The articles across different years have demonstrated that coverage of this problem in academic research and mainstream media has been present for some time. Despite this, recent studies have shown that gender bias still creates issues in the world of medicine. For instance, 80% of patients with unexplained health issues are women (Kaijer, 2021). Furthermore, women receive a diagnosis on average four years later than men would, this applies to more than 700 diseases (Westergaard et al., 2019). In addition to this, women experience side-effects from medication almost twice as often as men (Zucker & Prendergast, 2020; Nowogrodzki, 2017). Moreover, in some instances the lack of knowledge about the effects of medication on the female body may lead to an overdose of medication (Zucker & Prendergast, 2020). On top of that, female patients are often perceived as emotional or hysterical and therefore taken less serious than male patients (Hoffman et al., 2022; Samulowitz et al., 2018). This therefore remains a topic that requires action as it is a pressing issue that affects all women, which make up half of the population. Furthermore, it is not just a problem in The Netherlands, it is a commonly seen issue around the world (Wong, 2009).

These examples highlighted above already demonstrate four problems. Firstly, the diseases that mainly affect women are largely unknown. Secondly, symptoms of diseases, or disease progressions are different for men and women, but because much is unknown, incorrect or delayed diagnosis are common. Thirdly, because medication is mostly tested on men, a lot of women might not be receiving the correct medication or dosages which leads to unwanted side-effects. Lastly, female patients are treated differently than male patients and the gender bias held by doctors negatively influences women's health. All these problems are the consequences of a gender bias in the medical world that consistently disadvantages women (Criado-perez, 2019).

Healthcare historically has a focus on men where the male body was and is seen as the norm (Samulowitz et al., 2018; Maas, 2015). This has created a knowledge gap causing the problems listed above. The way that healthcare is currently practised is therefore contributing to gendered health inequalities (Ruiz & Verbrugge, 1997). Previous research has shown that especially the medical education is an institution that can contribute to and perpetuate this gender

bias (Criado Perez, 2019; Maas, 2015; Wong, 2009; Jimenez & Poniatowksi, 2004). The process of passing on male dominated knowledge from one generation to the next reinforces this, which is likely why a lot of current health professionals are still unaware of medical differences between men and women (Ballering et al., 2022). This thus begs the question whether future medical professionals are equipped with enough knowledge about these gender differences and whether they will exhibit a gender biased attitude towards their future patients.

1.2 Research context

This research has a good momentum because in recent years the discussion about gender bias in medicine has received broader attention in The Netherlands. Several initiatives have been undertaken to advocate for more gender-specific knowledge in education and care, such as alliances, programs, petitions and campaigns. Recognition of and action regarding this problem has thus been present for some time now in The Netherlands. In Groningen, where this research specifically will focus on, gender bias is also a topic of interest. The medical education in Groningen is linked to the University Medical Centre Groningen (UMCG), which is a training hospital. The UMCG strives to become a frontrunner in knowledge development about differences in medicine between men and women (UMCG, 2023). Because of this, it was the first hospital to open its doors for the foundation *Voices for Women*, with whom they have organised a symposium in November of 2023 addressing the gendered knowledge gap called '*Eve is not Adam'*. During this symposium different researchers working at the UMCG discussed their research regarding this topic. It is interesting to see whether this awareness and knowledge that is thus present within Groningen and within the UMCG, is also present among current medicine students from the University of Groningen. This research therefore aims to provide insight into the current state of the medical education in Groningen regarding gender bias, through the eyes of those attending the medical education.

This research will add to existing literature about a gender bias in the medical education, by studying students' perspectives. Previous studies have demonstrated the presence of a gender bias specifically in the medical education, such as a gender bias in medical textbooks (Parker et al., 2018; Parker et al., 2017; Dijkstra et al., 2008) and the content of the medical curriculum (Verdonk et al., 2009; Wong, 2009; Zelek et al., 1997). Research from the perspective of students has also been conducted, discussing how students experienced gender discrimination and sexual harassment during their education (Witte et al., 2006) or how a gender bias was present among medicine students in their online discussion boards (Cheng & Yang, 2015). Furthermore, surveys on sex and gender differences have been conducted among medicine students, asking them about the content of their curriculum (Jenkins et al., 2016; Kling et al., 2016; Miller et al., 2012). The results of these studies showed that most students indicated that their education did not incorporate sex and gender differences enough.

Thus, previous studies have mostly been done in other contexts, been of a quantitative nature or have been researchers' observations. Meaning that the researchers themselves have looked at the education and its curriculum. This qualitative study will focus on the perspective of

students in The Netherlands, specifically Groningen, on their curriculum and whether they themselves feel that a gender bias is present here. It will aim to understand, if present, how students see this gender bias manifest in their education. This research thus aims to understand the phenomena through the eyes of students themselves which can best be obtained by enabling them to share their opinions and experiences. For this reason, in-depth semi-structured interviews have been conducted with medicine students to achieve this understanding.

1.3 Objective and research question

This study aims to close a research gap and produce new knowledge about a student's point of view towards a gender bias in the medical education. By making use of a qualitative research approach, detailed descriptions of students' experiences within their education can be obtained. Additionally, the findings of this research will provide insight into the current state of one of the medical education institutions in The Netherlands, more specifically in Groningen. This can be of interest to teachers, educational policymakers and beyond. Ultimately, changing the medical education might be a pathway through which general institutional change in the world of medicine can be achieved (Girod et al., 2016). As these students will be the medical professionals of the future, it is important to see whether they feel equipped with enough knowledge about this important topic. The overall research question therefore is: *How do the experiences, awareness and beliefs of medicine students in Groningen shape their reasoning about a gender bias in their education?*

2. Theoretical framework

2.1. Definitions and concepts

Sex and gender

In this research the concepts of sex and gender will be used, they are related but different from each other. Sex refers to the biological characteristics of oneself such as chromosomes, reproductive organs and hormones and is categorised by the terminology of female, male or intersex. Gender refers to the characteristics of people that are socially constructed. This encompasses the set of norms, behaviours and roles ascribed to a certain gender, and also the relationships with each other. Gender is categorised by the terminology of woman, man or others. As a social construct, gender is different across societies and can change over time (WHO, n.d.). Furthermore, gender is strongly related to one's identity. Gender identity refers to a person's profoundly felt, unique, and internal perception of gender, which may or may not match their physiology or assigned sex at birth (WHO, n.d). Gender therefore knows more categories than solely the binary categories of woman and man, and especially in today's world this is a topic that is getting more and more important. In this research, issues regarding differences in sex and gender will be discussed. As currently a lot of knowledge is lacking about biological differences between male and female bodies and how gender plays a role, the focus here will lie on woman

and man or female and male. As sex and gender in many instances are intertwined and align, the terminology of female/male and woman/man will at times be used interchangeably.

Gender bias

This research discusses the matter of gender bias. The European Institute for Gender Equality (EIGE) has defined gender bias as prejudiced actions or thoughts based on the perception that women are not equal to men (EIGE, 2016). Gender bias relating to medicine and health, as described in the introduction, can best be defined as the unintended but consistent neglect of women and preconceptions based on stereotypes about their health, behaviour and experiences (Hamberg, 2008). It refers to the tendency to assume that the chances of being diagnosed with a particular disease are influenced by a person's gender, despite there being no underlying biological reasons to assume this (Howard, 2009). This gender bias often results in an overdiagnosis of the dominant gender, men, and an underdiagnosis of the neglected gender, women. Ruiz and Verbrugge (1997) describe gender bias as assuming similarities when there are differences and assuming differences where there are similarities. Meaning that men and women are seen as equal despite there being large differences, yet in other instances men and women are seen as different while they are rather similar. Instances where men and women are for example treated as equal whilst unequal treatment would suit better is in the case of prescription of medication. As a female body might respond differently to medication than a male body, here it is useful to distinguish (Zucker & Prendergast, 2020; Nowogrodzki, 2017). An example of an instance when men and women are seen as unequal whilst this assumption is biased, is the way patients are perceived. Female patients can be perceived as hysteric or emotional and therefore are taken less serious (Hoffman et al., 2022; Samulowitz et al., 2018). Naturally, they should be taken just as serious as their male counterparts.

Explicit or implicit bias

A person's bias can be implicit or explicit. An implicit bias is characterised as an automatic attitude, either positive or negative, towards an individual, idea, or group. This attitude operates within an individual's subconsciousness, without conscious intention or awareness (Greenwald & Banaji, 1995). An explicit bias on the other hand refers to an attitude that is consciously held by a person (Blair, 2002). Just like a bias can be either implicitly or explicitly present in a person, it can also be implicitly or explicitly present in the medical curriculum. For this reason, this research will try to get understanding of both the more explicit and implicit gender bias that might be present. This is why this research will try to gain understanding of both the actual medical curriculum as well as the hidden curriculum. The hidden curriculum refers to what educators teach students separately from the official curriculum, sometimes without even realising. Zelek et al. (1997) therefore described the role of the hidden curriculum as the importance of diversity of presentation and the use of non-gender-biased language in communication.

Medical professionals

The terminology of doctor and medical professional will be used interchangeably as in some instances one or the other might suit better, their meaning however is the same. Sometimes residents are discussed, these are students that are in training to become a medical professional.

They follow a residency, which essentially is an internship in one or more specialised health departments.

Experiences, awareness and beliefs

Lastly, central concepts in this research are awareness, experiences and beliefs. Experiences refer to students' own experiences and how these are shaped by the context (Hutter et al., 2020). This can either be how students have experienced their curriculum or about how they were personally affected by gender bias as a medicine student. Awareness can be defined as the ability to perceive, feel or be conscious of something (Gafoor, 2012). In this research, awareness refers to participants' awareness on the issue of gender bias and knowledge on existing sex and gender differences. Finally, beliefs can be defined as a personal judgement based on experiences and what is learned from others and teachings (Raymond, 1997). Which relates to students' beliefs about a gender bias in their education and about their own abilities. In this context, the concepts of experiences, awareness and beliefs are often intertwined. Students' experiences are shaped by their awareness of gender bias, which affects how they view their education. These experiences, in turn, shape their beliefs, and therefore playing an important role in shaping their perspectives and judgments regarding gender bias and their own capabilities as a future medical professional.

2.2 Background

The gender bias in the world of medicine is the consequence of decisions made in the past and the present. There are several aspects that have contributed to the current state of medicine, which are explained below.

Clinical trials

Historically, women were excluded from clinical drug trials (Willingham, 2022; Liu & Dipietro Mager, 2016). This decision was justified for two reasons. Firstly, researchers wanted to prevent the trials from negatively affecting the fertility or possible pregnancy of the participating women (Verdonk et al., 2009). Additionally, the female hormone system was said to disrupt the results of the clinical trials which also made it inconvenient to include women. Accounting for the effects of hormone cycles would increase the complexity and cost of the trial. Another reason why women were excluded from the trials was to prevent another scandal, such as Thalidomide or Diethylstilbestrol (DES). Thalidomide, or Softenon in The Netherlands, is a drug that was prescribed to pregnant women in the 1950's for sleeping and pain or as a remedy for pregnancy vomiting (Blockmans, 2014). However, new-born babies from mothers who had used this medication during their pregnancy were born without limbs or their feet or hands were directly connected to the torso. Alongside this, the prescription of DES caused another scandal, which is an artificial hormone that was prescribed to pregnant women to prevent miscarriages. It did not have this desired effect but instead it caused severe health issues for the mothers themselves, their children and possibly even grandchildren such as different types of cancer or fertility issues (Descentrum, n.d.). Because of scandals like these the FDA released the *General Considerations for the Clinical Evaluation of Drugs*. In this document it was dictated that women of fertile ages

should be excluded from the early phases of drug trials, phase 1 and early phase 2 (Liu & Dipietro Mager, 2016). In practice, women are often still excluded from later stages of the research as well (Dekker et al., 2021). Despite this, generally speaking it has become more common practice to include women in medical trials (Hoffman et al., 2022). However, results of these trials are often still provided as an overall result where no distinction is made based on participants gender. In addition to this, women frequently make up such a small proportion of the participants that a proper generalisation towards all women cannot be made (Willingham, 2022).

Side effects of medication

By excluding women, medication was only tested on male subjects. These results were then generalised to women and falsely assumed to have the same effects (Bird & Rieker, 1999). This assumption turned out to be incorrect, as for instance women experience a lot more side effects than men do, almost twice as often (Zucker & Prendergast, 2020; Nowogrodzki, 2017). Women are also 33% more likely to be admitted in a hospital due to the side effects of medication (Rodenburg et al., 2011). Besides this, women use more medication than men and for a longer period of time (Fauser et al., 2013). Additionally, women often receive an overdose of medication (Zucker & Prendergast, 2020). This is because the female body processes medication differently than the male body does. Differences in bodily aspects between men and women such as fat percentage, metabolic rate and body weight, influence the way and pace that medication is processed by the body (Soldin & Mattison, 2009). A striking example of this is the prescription of the sleeping drug Zolpidem. This sleeping drug had been on the market and prescribed to women for 25 years until it was discovered that women had been getting a dosage that was too high (Greenblatt et al., 2014). It is very likely that many women have been getting in their car the next morning while still being sleep-drunk.

Male norm

For a long time, men and the male body have thus been considered as the norm in medicine, and women as a deviation of this norm (Samulowitz et al., 2018). In some instances, women are considered to be 'small men', despite research showing that differences between men and women can be observed in all parts of the body and a relating to number of diseases (Mauvais-Jarvis et al., 2020; Marts & Keiit, 2004). In other instances, women are depicted as abnormal or atypical as they deviate from men, thereby implicitly stating that they are inferior (Wong, 2009). These attitudes prevent women from receiving proper care that looks at their body as it is, and not solely compares it to the male body.

Hierarchy in diseases

There also seems to be a hierarchy in diseases where 'women-diseases' are perceived as less important in society (Wong, 2009). These are diseases that are more common for women such as auto-immune diseases and depression. This is in line with studies about diseases, where less funding is made available for research looking into diseases that are more common for women (Mirin, 2021). As a lack of funding makes it harder to properly investigate these diseases, more information will remain unknown. This increases the gender gap in health between men and women even further. This lack of knowledge however also applies to issues that only happen to

women, such as the menopause. This is a process that all women experience after their fertile period, yet a lot is unknown about the symptoms that can and cannot be ascribed to this process (Bendien et al., 2019). This can also be observed for endometriosis, where a lot of general practitioners lack knowledge about this disease, which causes a delay in diagnosis (Van der Zanden & Nap, 2016). In addition to this, many medical professionals still lack knowledge about how disease patterns differ for men and women and the variability of symptoms between men and women (Cheng & Yang, 2015). The societal costs in The Netherlands of this lack of knowledge and attention to female specific conditions were estimated between €2.5 billion and €7.8 billion in 2022 (NVOG, 2023). This demonstrates that society as a whole would benefit from more attention to these issues.

Treatment of female patients

A consequence of the male dominated point of view described above is that female patients are treated differently than male patients. If medical professionals hold negative attitudes, these are particularly directed at female patients, as they are seen as more demanding (Foss & Sundby, 2003). Women are also more often taken less seriously when discussing their health complaints (Hoffman et al., 2022; Samulowitz et al., 2018). Their issues are more often labelled as psychological instead of physical (Munch, 2004).

The Netherlands

Researchers in The Netherlands have also brought attention to the topic of gender bias in medicine. The Dutch cardiologist Angela Maas demonstrated that the female heart is largely unknown (Maas, 2015). Women also have a higher risk of getting cardiovascular diseases after issues during pregnancy such as high blood pressure and diabetes (Maas, 2019). Moreover, Petra Verdonk has investigated the implementation of sex and gender issues in the medical education, and found that little to no courses or learning goals related to this topic, also at the UMCG (Verdonk, 2007). Lastly, emeritus professor of Women's Studies Medical Sciences, Toine Lagro-Janssen has also addressed this issue for many years and recently published the book S*ex- and gender sensitive medicine,* showcasing several areas where gender differences in health play a large role (Lagro-Janssen et al., 2023).

More specifically, also in Groningen different researchers have delved into gender differences further and presented their findings during the symposium *Eve is not Adam,* that was organised at the UMCG. Such as research by Bernadet Santema and others who demonstrated the fact that the 'one size fits all' approach regarding medication for heart failure might not always be suitable. The optimal dosage of medication for women with heart failure is considerably lower than for men, half of 'the normal' dosage is already sufficient for women (Santema et al., 2019). Research by Sieta De Vries and others showed that women are still often underrepresented in pre-clinical and clinical trials (Dekker et al., 2021). Another study showed that there are sex differences in the side-effects of medication, and that women experience more side-effects than men do (De Vries et al., 2019). Research by Aranka Ballering and others demonstrated that there are gender and sex differences in disease trajectories of physical complaints (Ballering et al., 2021). They also found that there are nearly no differences in communication between men and

women with their general practitioner. Despite this, women's words are interpreted differently and they are interrupted more often during a consultation with a general practitioner (Ballering et al., 2021). Lastly Iris Sommer and others investigated the protective role that oestrogen plays in getting psychotic disorders, while commonly prescribed antipsychotics have actually been found to suppress the production of oestrogens (Brand et al., 2022). Concluding, there is a bias in the world of medicine that has different origins and in turn also expresses itself in different ways. It can be interesting to see how this knowledge is translated into the medical education, as perceived by students.

2.3 The role of the medical education

As a gender bias exists in the world of medicine, particularly the medical education plays a large role here as it shapes the gender attitudes of future medical professionals (Finn & Brown, 2021; Parker et al., 2018; Wong, 2009). The medical education is considered as an institution that can perpetuate gender bias and that may actually be at the root of the problem (Parker et al., 2018; Jimenez & Poniatowksi, 2004). Specifically, because the foundation of Western medical education lies in the principles of biomedicine, which in itself is deeply rooted in male dominance or patriarchy, for instance meaning that men dominated the field as researchers, research subjects and doctors (Sharma, 2019). In the foundation of medicine lies an inherent bias towards a male-default perspective (Criado-Perez, 2019). As knowledge and perspectives are passed on from one generation to the next, this gender bias can persist.

Medical textbooks

There are several ways through which medical education can contribute to this gender bias. The first being through the medical textbooks, as they are still gender-biased and lack a lot of important information (Dijkstra et al., 2008). Many books do not systematically include gender-related aspects of different diseases and diagnosis information (Dijkstra et al., 2008). In many instances, men are considered as the norm and women are underrepresented or merely mentioned when it concerns reproductive organs or processes (Parker et al., 2017). Additionally, when anatomical illustrations of gender-neutral body parts are depicted, male bodies were represented three times more frequently than female bodies (Criado-Perez, 2019). The way that images in medical textbooks are currently depicted can affect students' implicit gender bias (Parker et al., 2018). An implicit gender bias is even more likely than an explicit gender bias to contribute to inequalities in the treatment and care of patients (Stepanikova, 2012). A study in The Netherlands however, examined the textbooks and curriculum of the medical education in Nijmegen, which found that over time more attention was paid to sex and gender issues (Van der Meulen et al., 2017).

Curriculum

The general content of the medical curriculum can also contribute to this gender bias. The subjects that are taught for example are a way in which the curriculum can be gender biased. Sex-and-gender related issues are often not systematically included in the development of the curriculum

(Dijkstra et al., 2008). Furthermore, the number of courses that are related to women's health is very low (Criado-Perez, 2019). Besides this, the way that knowledge is conveyed to students can contribute to their gendered attitudes (Zelek et al., 1997). This thus requires a critical look at content of lectures, seminars, workgroups or individual teaching for example during residencies, given the fact that the medical education often portrays the male body as the norm (Samulowitz et al., 2018; Zelek et al., 1997). In an attempt to counter this, efforts have been made to ensure that sex and gender related issues are incorporated into medical education. A study reviewing this implementation however showed that despite these efforts, still not all aspects were incorporated in education (Verdonk et al., 2016).

Communication

Gender bias also relates to the language that is used, as it may explicitly or implicitly reinforce stereotypes about a gender (Zelek et al., 1997). Additionally, attitudes from teachers in the medical education can also have a large impact. In line with language, comments that are made by professors may also create or contribute to stereotypes and create a gender bias in future medical professionals. An example of this was given by the Dutch cardiologist Angela Maas, who said that during her education teachers said that female patients were whiners (Maas, 2015). This can cause future medical professionals to take on a similar attitude.

Power dynamics

Power dynamics within the medical education can also perpetuate a gender bias. In The Netherlands 70% of medicine students are female (Mattijsen & Smabers, 2021). Besides this, in 2022, the share of female doctors in The Netherlands has increased up to 59% (CBS Statline, 2023). However, this division is not represented in the leadership and teaching positions. Men are implicitly more viewed as leaders than women by medical residents (Girod et al., 2016). In practice, male educators are a lot more common. In cardiology in The Netherlands for example, less than 1% of educators is female (Maas, 2015). More generally, in 2022 the percentage of female professors in university medical centres in The Netherlands was 29.7% and only 21.3% of the department heads was female (Women Professors Monitor, 2023). Although this is a larger share of females than it is in cardiology, and it has been increasing over time, it is still a vast minority.

Gender bias towards students

Lastly, medicine students themselves also experience a gender bias (Brown et al, 2020; Witte et al., 2006). This mostly applies to female students, as they are treated differently and communicated with in a different way (Hansen et al., 2019). Decisions of female residents are also challenged more than those of their male colleagues (Wear & Keck-McNulty, 2004). Besides this, female cardiology residents regularly experience sexist comments and behaviour which often lead to them deciding to enter a different specialty (Sinclair et al., 2019). Furthermore, a study that examined reference letters for residencies found that there were linguistic differences between reference letters for male and female residencies (Khan et al., 2023). Male candidates were more likely to be described using words like "leader" or "exceptional," whereas female candidates were more likely to be described using words like "delightful" or "compassionate." This demonstrates

that not only patients are negatively affected by gender-biased medical professionals, but medicine students themselves too.

Overall, the literature study has shown that the medical education can play a large role in the perpetuation of gender bias, as a gender bias seems to be present in several ways. Changing the medical education may be a way to contribute to general institutional change in the world of medicine (Girod et al., 2016).

2.4 Hegemonic Masculinity and Gender Order Theory

The principle of *Hegemonic Masculinity* has been used in other studies to explain gender bias in medicine (Samulowitz et al., 2018; Cheng & Yang, 2015). The principle originates from the work of Connell (2005) and is defined as the practice that legitimises the dominant societal position of men, and therefore the subordination of women. The affiliated theory that can help explain the presence of the phenomenon of gender bias is the *Gender Order Theory* (Maharaj, 1995). The theory refers to the intersection of institutional structures (gender regimes) and individual entities. Here the interplay between these entities generates social arrangements where one gender can exert political, social and economic dominance over another. This thus enforces hierarchical arrangements and power differences that can be observed in society. Due to this gender order, differences exist in rights, privileges, treatment and responsibilities. The gender order theory highlights the role of gender in enforcing social order, power disbalance and creation of inequalities. Furthermore, it states that the gender order is not fixed but socially constructed and that it can therefore also be challenged by activism and social movements. This theory provides a lens through which the current status regarding gender bias can be explained. The world of medicine is a heavily gender ordered world in which men and the male gaze have been dominant for a long time. Several problems highlighted in the sections above can be attributed to this gender order which favours men and therefore creates gendered health inequalities. Furthermore, this theory may help to recognise gender-biased patterns in the interviews with participants or help to explain a lack of awareness on this topic. The Gender Order Theory also highlights that the current gender order can be challenged and changed towards a more equal gender order.

2.5 Cultural Schema Theory

A theory that can be used to help gain understanding of students' perspectives is the cognitive-anthropological *cultural schema theory* (Strauss & Quinn, 1997; D'Andrade, 1995). This theory tries to explain how individuals perceive certain experiences or events as shaped by sociocultural norms around them. Thus, it is a way to gain understanding of how students' personal experiences and the sociocultural and medical context, which are types of schemas, shape their perspectives towards their education. Schemas are a type of simplified mental framework that an individual can use to make sense of the world around them (D'Andrade. 1995). These schemas are shaped by the context and culture in which a person is formed and socialised. These schemas include

information on social roles, customs and beliefs, combined with expectations on individual behaviour in specific situations. Some schemas are individual such as personal experiences or beliefs. Others are cultural schemas that are shared among a group of people that had similar social experiences (Strauss & Quinn, 1997). Here culture refers to the extent to which people have recurring, common experiences that lead them to develop similar schemas. For this reason, cultural schemas can differ a lot between and within countries, organisations or communities. The medical education can be considered as such a community where students attending the same education likely have shared experiences, awareness and beliefs. Students however can experience or internalise them differently due to their own personal upbringing and lived experiences. This present study will examine how students' experiences, awareness and beliefs, which are types of schemas, shape their reasoning about a gender bias in their education.

In some instances, these schemas can conflict with each other, causing internal conflict. For example, the schema of believing that women are better educators can conflict with the schema of a student not experiencing any female educators in their medical education. The personal experience of a student then does not align with their schemas about this. In other instances, schemas can interact with each other. For example, the belief that female medicine students study harder, can interact with the schema of a student experiencing female students getting better grades. Overall, this theory can thus help to gain understanding of the findings from the interviews and expose schemas that shape students' reasoning about their education.

2.6 Experiences, awareness and beliefs

This research particularly will focus on the schema's experiences, awareness and beliefs. These schemas can shape medicine students' reasoning about gender bias. It is therefore important to highlight what is currently known about these schemas in relation to the topic of gender bias in medical education. It should be noted that these schemas are frequently intertwined.

Experiences

Regarding students' experiences in their education, most studies showed that sex and gender were not a central topic according to students. In a study by Jenkins et al (2016), a majority of students agreed that the content of the curriculum was male dominated and a majority of students thought that sex and gender-based information were not sufficiently included in the curriculum. Similarly. another study found that students thought that information on this topic was not systematically included in the curriculum (Miller et al., 2012), and research by Kling et al (2016) also found that according to students' sex and gender differences were not consistently integrated in the program. Previous studies found that students' opinions about their education differed across years of study (Rrustemi et al., 2020; Jenkins et al., 2016). The longer a student was studying medicine, the more positive they were about the inclusion of sex and gender differences, and their gained understanding. Furthermore, it was also found that a higher percentage of male respondents thought that the coverage on sex and gender differences was "moderate to extensive" (Jenkins et al., 2016). On the contrary, female students may be more likely to discover anomalies in the material as the medical education follows a typical male model, thereby lacking information

related to themselves (Rrustemi et al., 2020; Jenkins et al., 2016). This may thus give an indication that participants of different sexes and study years might perceive their education differently.

In addition to information about experiences of the curriculum, studies on students personally being affected by gender bias could also be found. Several studies showed that female students report more experiences of gender biased attitudes (Brown et al, 2020; Hansen et al., 2019; Parker et al., 2016; Wear & Keck-McNulty, 2004). These findings suggest that a participant's gender may thus be a factor determining whether they experience gender biased attitudes themselves.

Awareness

A previous study showed that a majority of students indicated to be familiar with sex and gender differences in medicine (Jenkins et al., 2016). However, less than half of students felt that the curriculum had provided them with a better understanding of sex and gender medicine. Furthermore, only a third of students said that they felt their education had adequately prepared them to handle these gender differences in a clinical setting. There thus seems to be a discrepancy between students' awareness and the role of their education in obtaining this awareness, which could indicate that students' awareness on this topic comes from outside of their education (Verdonk et al., 2008).

Male participants were more positive about their understanding of gender differences (Jenkins et al., 2016). This may be explained by the fact that men are more often confident in their responses when filling in a survey, despite women often being more accurate (Theobald et al., 2015). Another study found that this confidence may sometimes be an overestimation as men were less likely to accurately respond to questions than women (Siriwardena et al., 2012). Another study also found that women are more aware of a gender bias in medical education (Parker et al., 2016). This may thus give an indication that participants of different sexes may have different levels of awareness.

Beliefs

Regarding students' beliefs about the topic of gender bias, previous research showed that almost all students of different years, both male and female, felt that learning about gender differences is very important and that it improves a doctor's ability to manage patients (Jenkins et al., 2016). However, another study found that women were more likely to believe that gender bias should be addressed in the education (Parker et al., 2016). This may thus give an indication that participants of different sexes may have different beliefs about gender bias.

2.7 Conceptual model and expectations

The conceptual model in *Figure 1* demonstrates how different schemas such as experiences, beliefs, awareness and the sociocultural context in medicine construct students' reasoning about a gender bias. Both Gender Order Theory and Cultural Schema Theory are incorporated in the model as they are the lenses through which the data is examined. Students' gender and study year are also taken into account.

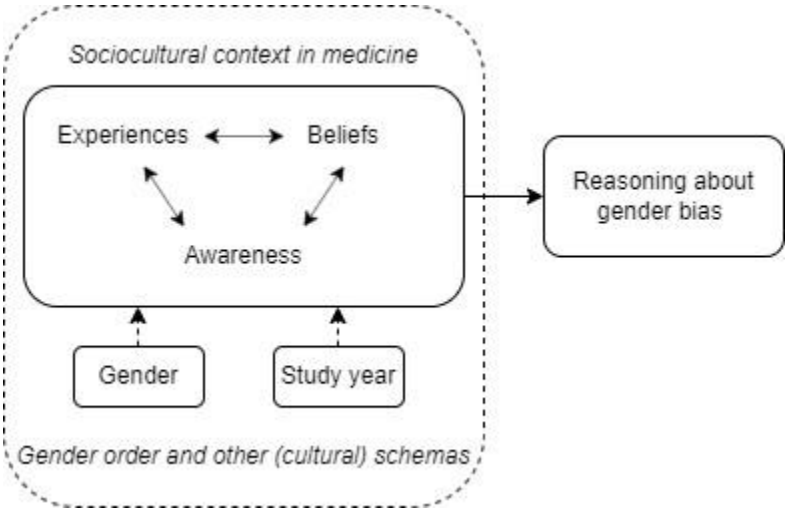

Figure 1: Conceptual model

Through exploring the perspectives and experiences of medicine students a gender bias could potentially be identified. Based on the literature review the following expectations can be formulated. It is expected that schemas, such as experiences, awareness and beliefs shape students' reasoning about a gender bias in the medical education.

First, regarding students' experiences, it can be expected that (1) students feel that gender differences are not discussed to a sufficient degree and that the male norm is prevailing. It can also be expected that (2) female students are more likely to be personally affected by a gender bias in their education than their male colleagues. Secondly, whether or not students are aware of a gender bias likely largely depends on how much information they have been provided with on this topic. On the one hand it can be expected that (3) the more awareness about this phenomenon is present among students, the more gender bias has been a topic of discussion in the medical education. On the other hand, it can also be expected that (4) if this awareness is lacking or if it comes from personal interest about this topic, participants might be more critical of their education and feel like this topic is not discussed enough. Furthermore, it can be expected that students believe that (5) this is an important issue and that it is valuable to learn more about. It can also be expected that (6) participants gender shapes their experiences, awareness and beliefs and lastly that (7) the year of study of participants shapes their experiences.

3. Methods

3.1 Research design

This research has an exploratory and understanding nature. It can be considered exploratory as qualitative research regarding students' perspectives and experiences in their education has not been previously conducted. The understanding nature implies that this research tries to gain knowledge and understanding about how students themselves experience their education. The qualitative design of this current study allows for a deeper understanding of how students view their education and how their reasoning about a gender bias in their education is shaped. This approach provides insights that cannot be captured with quantitative research. Interviewing participants allows for understanding of the phenomena through their eyes. Because of this, the focus does not solely lie in trying to understand the participants, but to get an even greater understanding, which is referred to as *Verstehen*. This means attempting to understand behaviour, beliefs, opinions and emotions from the perspective of participants themselves. This can also be referred to as understanding something from the emic perspective, meaning understanding it from the inside (Hennink et al., 2020). In the case of this research this can for instance be that a participant can elaborate on a negative experience they have had, expressing what was said, who said this, how this was said, in which context and how this made them feel. This will provide me with a better understanding of their experience, as if I were there myself.

As this research focuses on the perspectives of participants, a more detailed point of view can be obtained through conducting interviews (Hennink et al., 2020). Therefore, interviews were chosen as the appropriate research method over a focus-group discussion or observations. Interviews allow for in-depth understanding of an individual student's perspectives, experiences, context and for a private setting in which they can discuss their experiences. A focus group discussion was therefore not conducted as it does not provide the opportunity to focus specifically on one's personal situation, which was something I wanted to do in this study. Furthermore, another possibility would have been to conduct observations as a researcher myself, for example by attending lectures. However, hereby I would be imposing my own interpretations on these students' education and their experiences. Because I am interested in the perspective of current medicine students themselves this method was not suitable. Thus, semi-structured in-depth interviews have been selected as the appropriate research method. It possesses a less structured interview guide which allows for more flexibility during the interview (Hennink et al., 2020). Because of this, the interview could flow more naturally and feel more like a conversation which might foster more meaningful interaction. It also provided somewhat of a structure which was convenient when trying to compare experiences of participants.

This research made use of a predominantly interpretive approach. However, within social sciences and therefore also within sociology and demography, the dominant research approach, or paradigm is often positivist. The positivist approach relies on principles of testable hypotheses and empirical investigations where support can be found for these hypotheses (Hennink et al., 2020). Some aspects of the positivist approach will be integrated in this mainly interpretivist

research as well, such as the integration of theory and a literature review, formulated expectations and a conceptual model. Qualitative research is characterised by its iterative research process. This means that it is common to go back and forth during the research process, which allows for more flexibility to adapt or specify strategies during the process. Changes that are made are driven by new insights obtained from the data that has been collected which might steer the research in new directions. For this reason, this iterative process can be considered evidence-based as it lets the data speak and steer the process. This process of going back and forth is also described in the qualitative research cycle (Hennink et al., 2020). This process could be observed in different phases of the research. For instance, during the conduction of interviews, here I had left space for inductive inferences during the interview which sometimes meant that some background or general questions were not asked, thereby increasing reliability. After a number of interviews, some questions were also emphasised more as they appeared to yield more relevant information. Similarly, during the process of coding I also went back and forth a lot, by adding new codes and changing the names of codes. The cyclical nature of the research process thus demonstrates both the deductive and inductive aspects of qualitative research and highlights the iterative nature.

3.2 Study population

This research focused on students of the bachelor and master *Medicine* from the University of Groningen. It is a well-established medical education that is among the best in The Netherlands. The bachelor is taught in both Dutch and English, whereas the master is only taught in Dutch. The medical education in Groningen is linked to the UMCG and as shown before, several researchers from the UMCG have conducted research that highlights health differences between men and women. It is therefore interesting to see whether the knowledge that is present in the UMCG is also translated into education according to students. It is beneficial to examine the education through the perspectives of students as they are taught within this system. They are the ones attending the lectures, reading the textbooks and the ones that are shaped by this education. Therefore, research into the perspective of medicine students can provide insight into the current state of the medical education and the knowledge of these future medical professionals. Furthermore, students attend both the in-class education and the education in a hospital context during their residencies. Students are therefore able to discuss the education as a whole. Lastly, the medicine program is established in Groningen where I also study, which eases the process of participant recruitment and physical interviews.

This research made use of purposive sampling as there were specific wishes about who should be included in this research (Hennink et al., 2020). First, I wanted to include both female and male participants in the sample as this allowed for a comparison of their perspectives. Additionally, I wanted to include participants from different study years was because this would hopefully provide more insight into the medical education as a whole. Students from different years likely had more knowledge about courses they attended recently or were attending at the time of the interview, which could lead to more interesting and detailed descriptions and

experiences. As the data collection took place at the start of the academic year, first year students were not included as they only had a few weeks of classes by this time. Furthermore, I wanted to focus on the Dutch track of the education which meant that the interviews were conducted in Dutch. This was most suitable as this research focussed on the Dutch context and Dutch hospitals where the dominant language is also Dutch. Understanding of the Dutch language and the Dutch context therefore suited this research design best. In addition to this, Dutch was the mother-tongue of both me and these students which allowed for a more in-depth discussions and understanding of participants perspectives.

Sample selection

In order to recruit participants, I have first approached medicine students in my network. I reached out to people in my network asking them if they knew medicine students in Groningen. Most students are very occupied with their studies, which likely made it harder for them to spare time to participate in this study. I assumed that being able to reach out to them through a mutual connection would make participants more willing to participate in this study, which likely indeed has helped. Most participants were approached via WhatsApp or LinkedIn to ask them if they wanted to participate in this study. The reason for selecting these measures of communication was because this made the communication feel more informal. In addition to this, through snowball sampling participants were able to put me in contact with other medicine students that fit the characteristics that I was looking for, specifically from different study years and both male and female participants (Hennink et al., 2020). A few participants also send text message in their WhatsApp study group chat stating that I was looking for participants for my research, this however did not lead to further participants.

Participants

The total study population consists of 12 medicine students from the University of Groningen, as saturation was felt to be achieved after these 12 interviews. Half of the participants were male and the other half was female. Of these participants, nine attended the Dutch track of the bachelor, in addition to this, three Dutch-speaking participants attended the English track. Two of these participants grew up abroad but still spoke Dutch. Despite these students attending the English track, these interviews have also been conducted in Dutch. This means that during the process of data analysis, all quotes that were used in the research have been translated to English. The youngest participant was 20 and the oldest participant was 26 years old and the average age was 23. Nine participants were in their masters, the other three participants were in the final year of the bachelor degree. Here, no equal division of participants from different study years was obtained. A brief description of the participants can be found in *Table 1* below. All participants have been given a pseudonym name.

Table 1: Overview of participants pseudonyms, sex and year of education

Participant	Sex	Study year
Amy	Female	Bachelor 3
Bella	Female	Bachelor 3
Celine	Female	Master 1
Diana	Female	Master 2
Emma	Female	Master 2
Flora	Female	Master 3
Alex	Male	Bachelor 3
Benjamin	Male	Master 1
Chris	Male	Master 1
David	Male	Master 2
Eric	Male	Master 2
Frank	Male	Master 2

3.3 Interviews

The interviews took place in a meeting room at the faculty of Behavioural and Social Sciences from the University of Groningen as it is central in the city of Groningen, which made it convenient for participants. It is also a faculty that I am familiar with and where I knew how to arrange such rooms. I anticipated that these meeting rooms created a neutral and private environment. Students were asked beforehand if they were okay with the interview taking place here, this was the case for all who were asked. Four interviews took place online because the participant preferred to do so. This allowed me to interview medicine students that were currently doing their residency (in another city), despite their full schedule. The downside of this was that this was more susceptible to technical issues, but this ended up only happening once, and it did not disturb the interview. Besides this, it was also a bit more difficult as a researcher to ensure a safe environment for the participants and to observe their body language to make sure they were comfortable sharing information. However, because these participants were in their own home, it can be assumed that they felt comfortable discussing everything. From my side, I made sure to be in a private room too while conducting the interview so others were not able to listen. Regarding rapport building, this was different when we were both present online. For this reason, we took a bit more time to chat before starting the interview, in order to ensure that participants felt comfortable.

During the interview I made use of an interview guide which was composed based on theory and literature. The interview guide consists of all interview questions and probes that could be asked to the participants (Hennink et al., 2020). It was used during the interview to look back at and to maintain somewhat of a structure during the interview. This interview guide consisted of some general background questions, some questions to build a rapport and mostly open-ended questions that foster more in-depth answers (Hennink et al., 2020). It also contained some probing questions that could be used during the interview to obtain more information from the participants when this did not come naturally (Hennink et al., 2020). A pilot interview was conducted with a female medicine student in Groningen that I knew, to provide some insight into the structure of the interview guide and the duration of the interview (Hennink et al., 2020). This also created the opportunity to see if these questions were easy to understand and whether they allowed me to obtain the information I was looking for. This pilot interview has also been included in the dataset as it provided valuable information. After the pilot interview, some adjustments were made to the interview guide. The final interview guide can be found in *Appendix C*. The interview guide has been subdivided into a few parts: (1) rapport building, (2) general questions about their education, (3) asking about their awareness of and reasoning about gender bias beforehand, (4) asking about their experiences in their education, (5) showing them information and asking them to reflect on this and lastly (5) asking about their awareness of and reasoning about gender bias afterwards.

In order to provide the participating students with an idea of what exactly is meant by the concept of gender bias in the context of medicine, the definition of gender bias by Hamberg (2008) was read to participants as it is the definition that is adhered to in this research. Besides this, a list of numbers and findings from different studies was shown to participants halfway during the interview, which can be found in *Appendix D*. This allowed them to reflect on the information that was presented to them and to consider how they felt about this information and whether or not it seemed familiar. Another reason for wanting to show them this information is because it made the interview feel more scientifically based. I wanted to show students that this was not just my personal interest but also something that other researchers have looked into. I also could potentially broaden their knowledge on this topic, which afterwards was mentioned by a few participants as something they appreciated. The reason for presenting this information at a later stage of the interview was because I wanted to see what students would think of this topic themselves, without being influenced by this new information. If I had shown this list in the beginning their answers would be steered by this information and it could also result in more socially desirable answers. Also, by presenting the information at this stage, this could be seen as an intervention, which allowed for a comparison of their thoughts before and after this information. As such I asked the participants at the beginning of the interview how they felt about a gender bias in their education and whether they thought this was present or not, I then asked them the same question at the end.

3.4 Data analysis

All semi-structured in-depth interviews were conducted between August and October 2023. Participants gave consent to an audio recording of the interview. This allowed me to make a verbatim transcript of the interview instead of solely notes during the interview. Because of this, the quotes that are used in this research are in participants' own words. It also allows for a deeper understanding of their perspectives and the context. I transcribed the interviews myself using Word. The duration of the interviews was between 33 minutes and 65 minutes, with an average duration of 48 minutes. The transcripts of the interviews have been coded using the software Atlas.ti. A Thematic Analysis was used to analyse the data, which involved searching the data for certain patterns and themes that reoccur. It allowed me to unveil collective experiences and to identify themes that provide a deeper understanding of the data as they highlighted the central underlying concepts (Terry et al., 2017). More specifically, a Codebook Thematic Analysis was suitable for this research. The goal of this analysis is to establish a structured coding framework. This allowed for the identification of predefined themes that were deductively based on theory and central concepts. Because of this a deductive codebook was made, which is composed of codes that were based on theory, literature and central concepts (Hennink et al., 2020). In addition to this, the Thematic Analysis also allowed for the distinguishing of new inductive themes that emerged from the data.

The data analysis process started with becoming familiar with the data. The process of transcribing the interviews can be seen as the first step, as this meant going through the data word for word. This process was then continued by extensively reading the transcripts afterwards. Mostly broad codes were applied to the data, based on questions asked during the interview. For instance, codes such as 'discussion of gender bias' or 'gender differences medical textbooks. These codes turned out to be quite helpful trying to get a sense of how participants felt about these topics. During the coding process, memos have also been made which are notes that were added to the data with an idea for a new code (Hennink et al., 2020). Some of these memos have eventually been transformed into inductive codes when proven suitable. These are thus codes that were not expected beforehand but turned out to have an important role later on. For instance, inductive codes such as 'heart' or 'training spot', which were brought up by participants. An example of an in vivo code, in the words of the participants themselves is 'prevalence' which was used to describe the division of men and women affected by a disease. The data was also searched for instances where a gender order was visible and to see which findings could be ascribed to a scheme. Finally, during the process of coding some codes were added later on, deleted or merged when found suitable. All codes can be found in the final codebook, in *Appendix E*. Due to the chosen Codebook Thematic Analysis approach and because the deductive codebook was quite extensive most of the transcript could be coded using the deductive codes, meaning that not many inductive or in vivo codes were added. To allow for a more in-depth analysis and observation of other patterns as well, other aspects were also taken into account (Hennink et al., 2020). For instance, in addition to distinguishing important themes in the data, a comparison between male and female participants

was made and additionally one's study year was taken into account. The important themes that emerged from the data were the following: (1) lack of information sharing about gender differences (2) lack of recognition of problem of gender bias (3) gender biased attitudes and (4) lack of confidence in abilities.
After finishing the codebook, analysing the data further, selecting quotes and establishing important themes, the result section could be shaped. Here it was chosen to stick to the structure of the central concepts in this research as they shaped participants' reasoning about gender bias.

3.5 Ethical considerations

In this research, the following ethical considerations have been taken into account: consent, anonymity, confidentiality, justice, beneficence and minimization of harm (Hennink et al., 2020). Before starting with the interview participants signed an informed consent form, which ensured their rights, anonymity and confidentiality, which can be found in *Appendix C*. A description of how data was handled safely can be found in the data management plan in *Appendix A*. Beneficence was also prioritized, by striving to maximize societal benefits of this study. Participant's participation was entirely voluntary and no exploitation or deception of the participants took place. Furthermore, the principle of 'no harm' was adhered to by ensuring anonymity and stressing that participants could speak freely and that all their perspectives, no matter what, were valued. As this research could be sensitive, for example when discussing personal experiences with gender bias, these topics were handled cautiously and it was emphasized that participants could refuse to answer at all times if they did not wish to respond. The use of snowball sampling has also helped by comforting new participants about this research as they could hear about the contents of the interview from people who had already participated. Lastly, participants were not paid in order to ensure unbiased information. Instead, as a small gesture a chocolate bar and a thank-you note were given as an expression of gratitude for their voluntary participation.

Positionality

In addition to the ethical principles discussed above, it is also important as a researcher to reflect on my own positionality. Positionality refers to the power dynamic and relation between the interviewer and participant (Hennink et al., 2020). During this research I have kept a professional attitude towards participants, despite the fact that the participants and I were both students and therefore of similar age. Students could have perceived me as an outsider as I do not study medicine myself. They could also think that I therefore have less knowledge about this topic. For this reason, I have tried to make it clear to participants that I want to hear about their perspective which was stimulated by asking them open-ended questions. I also decided to show the participants a list of numbers and findings from scientific research to justify my research aim. During the interview it was important to be respectful and not to steer the participant with verbal or non-verbal communication. I have therefore kept an open posture during the interview and ensured the participants that they can speak freely. I mentioned that I would be asking questions

just to understand exactly how they experienced their education and not because I wanted to hear specific information from them. I have also formulated my interview questions in such a manner that they do not implicitly assume that students think that a gender bias is present in their education.

4. Findings

This chapter discusses the findings from the interviews that were conducted among medicine students in Groningen. In this chapter the schema's *experiences, awareness* and *beliefs* are discussed and how these relate to students' reasoning about a gender bias in their education. Each section has different sub sections, representing the different information that was gathered during the data collection process. The last section encompasses the recommendations that participants have done regarding the implementation of the topic of gender bias in their education.

Figure 2 below visualises how the four themes that emerged from the data relate to the schemes used to investigate students' perspectives. The gender order in the medical education can be considered as a type of cultural schema, shaping the cultural norms and customs in the medical education. This gender order has shaped students' experiences, awareness and beliefs. The theme of gender biased attitudes is coloured red as here differences between the experiences of male and female and bachelor and master participants could be observed. How these schemas below have shaped students reasoning about a gender bias, will be addressed in the following sections. Here, the themes that emerged from the data will be highlighted too.

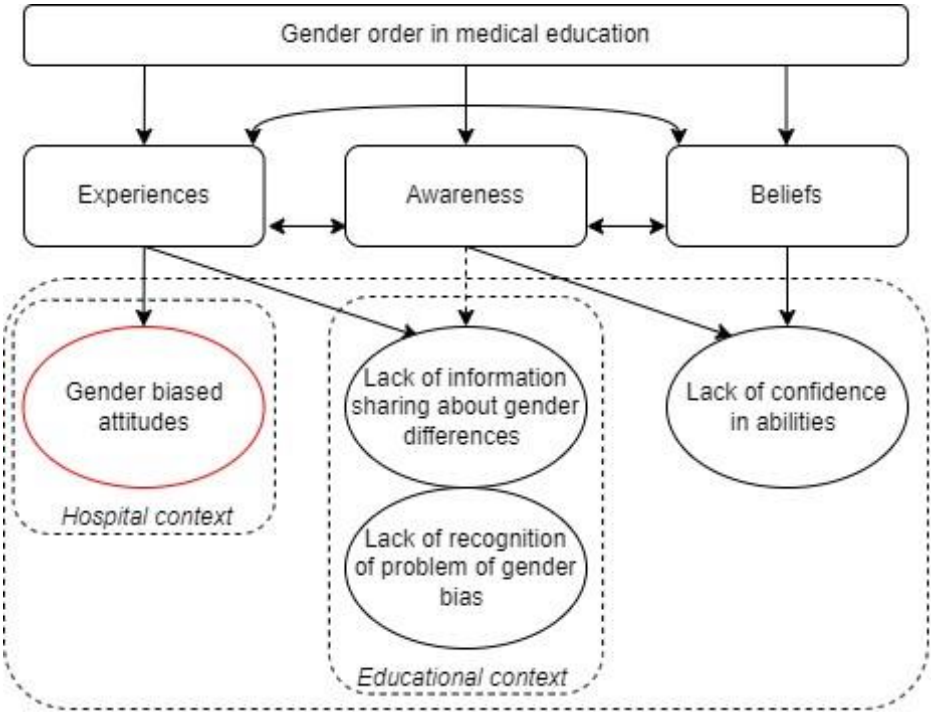

Figure 2: Model of findings, including gender order, (cultural) schemas and themes

4.1 Experiences

A core focus of this research is how students themselves have experienced their education. Their experiences shine a light on how the medical education is organised and what topics are discussed and in what manner. It also provides insight into how medicine students themselves were affected by a gender bias which in this instance will be referred to as personal encounters with biased attitudes. This section is therefore divided into the following sections: *curriculum, discussion of patients, personal encounters with biased attitudes*.

4.1.1 Curriculum

This section goes in further depth about the curriculum. It discusses how students have experienced the content of the lectures and the medical textbooks. The content of the lectures has been subdivided into *discussion of gender bias*, discussion of *gender-specific health issues* and *discussion of gender differences* and the last section will be about *medical textbooks*.

Discussion of gender bias

In this section of the findings the theme *lack of recognition of problem of gender bias* becomes evident. As gender bias is the central topic of this research, participants were asked to what extent gender bias was a topic of discussion in education settings. Most participants mentioned that gender bias was not a topic that was explicitly discussed in the education and that the male norm prevailed.

According to participants, the term gender bias as such was not or only scarcely mentioned in the education. They said that it was not consistently acknowledged that a problem is present in the world of medicine. Furthermore, the serious negative consequences that this has on women and their treatment were not acknowledged. Some participants mentioned that gender bias is not discussed in lectures but that work groups or coach groups do provide the opportunity to discuss this phenomenon. However, these participants felt that this is not systematically discussed but rather something that can be brought up by students as a topic of discussion, as mentioned by Bella:

> *"Well generally speaking, no. I think in the work groups rather than in the lectures. That it did come up in the work groups. So, I think it can be discussed there. But then it really depends on whether the students bring it up or not. It's not like supervisors systematically bring it up. It depends a bit on what kind of discussion is going on." - Bella, B3*

Some participants did indicate that it was mentioned to them that the medical education is based on men and that the male body is seen as the standard. They mentioned that the focus in the education lies on a Caucasian healthy man of specific bodily proportions, such as a certain weight and height. They said that the male body and its functioning, is thus the norm that is adhered to

in medicine. Most participants said that the implications of this view where the man is seen as the norm, were not mentioned. Only in some instances, participants were told that what they learned about diseases could present itself differently for different patients, but how exactly was not elaborated on, as Amy stated:

> *"When we have physiology classes, for example, they do always say of it's actually about the 20-year-old man, say the average 20-year-old man, that's really just what they base everything on. So, for instance, when you get lectures on gas metabolism and all that sort of thing, they do mention the sporty 20-year-old man, which is, so to speak, what the book focuses on. But then they do mention that it can of course go differently, nothing is crazy, but this is so to speak the norm." – Amy, B3*

The findings above may indicate that within the medical education, a gender order is still present. According to participants, the focus lies on the male body and the implications of this male norm are not discussed. Both male and female and bachelor and master students seemed to feel the same way about this. Thus, the lack of recognition of the problem of gender bias in the curriculum could be observed here.

Discussion of gender-specific health issues

This section focuses on gender-specific health issues and particularly on female-specific health issues. Most participants mentioned that in general, gender-specific health issues were discussed to a sufficient degree.

Participants were asked about the information they were presented with on female-specific health issues. The questions predominantly focussed on endometriosis and menopause as these are issues where knowledge still seemed to be lacking (Van der Zanden & Nap, 2016; Cheng & Yang, 2015). Most participants however felt that topics such as endometriosis and menopause were discussed to a sufficient degree in the course on gynaecology, such as Frank:

> *"Yes, endometriosis has been treated quite extensively indeed. Yes, like any other condition, how does it arise, what exactly is it, how is it treated, how is it diagnosed. And that's also separately explained, that it is an underexposed problem. And that it is actually a very big problem, which was previously not really recognised or given enough attention. So, I would definitely say that it is no longer underexposed in education in any case."- Frank, M2*

They also felt that enough information was given about the range of health issues that could be caused by endometriosis and menopause. Participants mentioned that lists of symptoms were given and that it was made clear to them that numerous issues could occur. Treatment options for particularly menopause, such as hormone treatment were also discussed. Despite this, Diana

highlighted that because it was only a brief time period where female specific health issues were the central topic, these issues were not discussed very extensively:

> *"Yes, with menopause, that results in us not going into that in much depth, but just how it works in your body. And you just learn a lot of symptoms and then you remember maybe 5 of them or so. And then you move on with your life. And endometriosis, yes those are all things that then fall into the gynaecology block of 4 weeks. In which you spend two weeks on obstetrics, i.e. pregnancy. And a week of, say, menstruation and things like that and another week of other stuff, that's what it was like. So yeah, you just don't go into it very extensively, super deep then." – Diana, M2*

Furthermore, participants were asked whether patients with gender-specific health issues were represented in patient lectures. These are a type of lecture where a patient comes to a lecture to talk about their illness. Most participants indicated that gender-specific health issues indeed were discussed as several patients with gender-specific diseases were invited to discuss their condition. This applied to both female- and male-specific health issues, such as breast cancer, endometrial cancer, cervical cancer but also penile and prostate cancer relating to urology for example. In addition to this, participants were also asked whether they were told during such lectures that, in the case of general diseases, symptoms or disease progressions could potentially differ between male and female patients. Most participants indicated that this was not the case. According to most participants the education did pay attention to issues solely affecting men or women, but that it was mostly general diseases where gender differences can exist, where information was scarce. This is described in the next section. Both male and female participants from the bachelor and master had similar feelings about this.

Discussion of gender differences

In this section of the findings the theme *lack of discussion of gender differences* becomes evident. Participants were asked to reflect on what was discussed about differences between men and women concerning their bodies or the way they are ill. Most participants foremost highlighted that little attention was given to gender differences.

When asked about gender differences, some participants mentioned the 'classic example' of the heart attack. This was an example that came to mind for most participants as according to them it was the most striking example that has gotten a lot of attention in the media recently. Participants mentioned that the way that heart attack symptoms present in women is different from the standard way, which is how it presents in men. How symptoms present in women is usually considered atypical, as illustrated by Flora:

> *"A cardiologist who was a specialist in women and who said that a heart attack, for example, the symptoms we learnt, that that is very much typical of what a man has. And that a woman can therefore, we call that, present atypically. So, which is already a bit funny, because how does a woman present atypically and not the man. That alone says something. That a woman presents atypically with a heart attack because we have studied the male heart attack the most." – Flora, M3*

As Flora suggested too, the view of considering women as atypical may be another way in which the gender order in medicine becomes evident. When participants were asked whether gender differences in heart attack symptoms were also discussed in the education, most participants indicated that this was often the case. They felt that this was the first issue that brought attention to differences between men and women. Bella however highlighted that she had been waiting for a further elaboration on male-female differences in cardiac diseases during the cardiology course, but that it did not come up:

> *"I remember in cardiology I was really waiting for, I think a lot of people already know that a heart attack presents very differently in a woman, that's kind of the example because of which people started thinking about differences. And that just didn't come up in my lecture. I remember we were really kind of waiting for that of well okay and now we are also going to see how it is in women because even that classic chest pain is just very often not there. Well, that's just not mentioned." – Bella, B3*

Another participant, Emma, also mentioned that only when doing her residency in cardiology she learnt about differences between men and women:

> *"Yes, that's not in the education. You hear a lot of that now, that that's now in the media a bit and the cardiologist is also working on that a bit. That that's now coming up a bit. And then I think, it's such a pity that we didn't have that in training. And that I am only hearing about it now during an internship." Emma, M2*

These inconsistencies in experiences may suggest that this topic is not fully integrated in the education yet, as it has not come up in all cardiology courses throughout different study years.
In addition to this, participants were not all able to mention the symptoms that were in fact specific for women experiencing a heart attack. This may indicate that these gender differences are indeed not a topic that is discussed extensively. According to participants, besides the heart attack, little to no gender differences were discussed in the education. Also, no courses specifically about this topic were taught. A participant did mention that differences in the prescription of painkillers was something she had learnt about. Another participant mentioned that women are diagnosed with psychological issues more often. Besides this, they described little further

information about gender differences that was addressed in their education. Most participants highlighted that the general patient is discussed but that no distinctions are made between men and women. Another participant, mentioned that he too felt that knowledge on gender differences is often lacking. However, he thought that if the knowledge was present, it would be shared in the education. Furthermore, a few participants mentioned that differences in prevalence of certain diseases for men and women were mentioned in the education, as Eric mentioned:

> *"I think there's say apart from being told 'well this disease occurs 50/50 or 10% more in women, and 10% more in men' that besides that relatively little is talked about the differences." – Eric, M2*

Some participants also mentioned that knowledge about the way that the body processes medication was based on men. Here, according to participants no distinction was made in how male or female bodies process medication differently or how side-effects can differ, as Frank highlighted:

> *"Yes, and that the kind of the default model of humans, that that is kind of a male body. All the data is based on that. If you have a medication, how long it takes for it to leave the body, that is all tested on men." – Frank, M2*

They mentioned this when they were shown the list of information halfway through the interview. Here information was provided about how side effects of medication are more prevalent among women and that women more often receive an overdose of medication. Most participants indicated that this information was not broadly discussed, as illustrated by Bella:

> *"And yes, that is about the use of medication, there is also some mediation that you are really more likely to use on a woman than a man anyway and we just don't get to hear anything about that." – Bella, B3*

Two participants, like Diana, mentioned that such information about differences in side-effects could also not be found on a medical forum where all medical professionals find their information on medication:

> *"For instance, we always look at the Pharmacotherapeutic Compass when we are going to prescribe something to someone. And if we prescribe something to children we will look separately at another thing, at the Children's Formulary. But there is nothing in the compass about differences in prescription for men or for women. In terms of side effects, that is absolutely not specified." – Diana, M2*

It could be noticed that students in their bachelor degree expressed that they hoped or thought that they would learn more about these differences in the master's education. However, most master students also had not heard a lot of information about gender differences, indicating that the lack of information sharing about gender differences can be found throughout the whole medicine program. Among male and female participants little differences could be observed in their experiences about this.

Medical textbooks

In this section of the findings the theme *lack of discussion of gender differences* becomes evident. Participants have reflected on the content of the medical textbooks. Most participants indicated that gender differences were not or only scarcely mentioned in the books. They also indicated that most information was about the 'standard patient', which was a man, as illustrated by Bella:

> *"And also just the whole book of physiology is just made on men. So, lung capacity that we have to learn or the percentage of oxygen or just oxygen in general, all those numbers we have to learn about, that are the male dimensions." – Bella, B3*

Many participants mentioned that prevalence of a disease was mentioned in the book for almost all diseases that occur to both sexes. Another participant said that if there was a clear difference between men and women, this was mentioned in the textbooks.

Participants also reflected on the anatomical images in the medical textbooks. Some participants indicated that the gender depicted in these images was not something they paid attention to, or had not realised that a possible pattern could be observed. Most participants however suspected that more male bodies were depicted in these images. The combination of little information on gender differences in the books and the depiction of mostly male bodies may indicate that textbooks are adhering to the male norm. Here hardly any differences could be observed between the experiences of male and female and bachelor and master students.

4.1.2. Perception of patients

In this section of the findings the theme *gender biased attitudes* becomes evident. The perception of patients was included as it gives insight into the attitudes that medical professionals implicitly or explicitly hold against patients and whether differences between the discussion of male and female patients can be observed. These attitudes can shape the attitudes of future medical professionals as well. Participants were asked to reflect on how patients were discussed and whether gender differences were present here. All participants indicated that if patients were discussed during the bachelor this was with respect and that students were also taught to be respectful. There however seems to be a discrepancy in discussion of patients in the education versus the hospital setting. In the latter, a different narrative can be observed. Celine and others indicated that female patients were not always taken as serious as male patients:

> *"Generally speaking, they are very respectful, especially at university. I do notice that, in hospital it is sometimes different business. But at the study programme, people generally talk about every patient in a fairly neutral way. So that's nice indeed, no joking remarks or anything like that. But yes, I do notice that in general perhaps a woman is more likely to be called a whiner than a man, and that is what is then sometimes said." – Celine, M1*

Another participant, Frank, mentioned that it was mostly male doctors who made comments about female patients:

> *"I did experience sometimes, that were also male doctors in the hospital, and then a comment like 'oh, pff, that was a woman, who is whining about that again', kind of like that, a bit stigmatising." – Frank, M2*

In addition to this, a few other participants mentioned that more comments were made by medical professionals about women and their bodies, as illustrated by Diana:

> *"In general, by the way, women's weight is really more judged than men's weight. Yes. All the 'dickish' comments about fat people were actually almost always about women." – Diana, M2*

Participants were asked whether they felt that female patients were seen as more emotional, a number of participants thought so. Most of them felt that this was not necessarily a bad thing or an incorrect assumption. However, seeing a female patient as more emotional might be a sign of an implicit gender bias. As Emma for example mentioned that she thought a female patient was often 'screened':

> *"But with female patients I do have the idea that they are often emotionally screened. Say if it's a woman and she says she's in pain, I have the idea that they do think about whether it's really because of the pain, or whether it's just a reaction on something else. How should I make that clear? A woman is often portrayed as someone who is very emotional. Who often cries a little bit more, and whines." – Emma, M2*

This implicit attitude too may hinder women from receiving the proper care needed. Female participants more often expressed that they thought female patients were taken less seriously and seen as more emotional than male participants. When participants noticed this, it was mostly in the master which is why mostly master students addressed this. This is also because these attitudes could predominantly be observed in a hospital context. However, some bachelor

students discussed similar situations they had encountered in side-jobs that also took place in a hospital or care setting. It can thus be observed that there is a conflict between what students are taught in the bachelor about respect and equal treatment of patients, and what students witness regarding the discussion of patients in the hospital context.

4.1.3 Personal encounters with biased attitudes

In this section of the findings the theme *gender biased attitudes* becomes evident. As shown in *figure 2,* this theme could predominantly be observed in a hospital context, which these findings will illustrate. Participants were asked if they were personally affected by gender bias and if they had encountered situations in which they personally felt treated a certain way because of their gender. Personal encounters with gender biased attitudes in the education can be subdivided into two parts, being *gender bias from other medical professionals* and *gender bias from patients*.

Gender bias from other medical professionals

This section discusses the experiences of participants in relation to gender biased attitudes of other medical professionals. Most participants indicated that during their bachelor education participants felt that they themselves were not treated differently because of their own gender, in the hospital context they did experience such instances.

Both male and female participants discussed that they received comments about finding a training spot, but both in a different manner. This is a training spot in a specialisation after completing the master in medicine. These training spots are strongly desired but scarce at the same time. Some participants were told that men could have a benefit in finding a training spot. Male students have an advantage because currently a vast majority of medicine students is female. For this reason, they were more 'desired' because most hospital departments would like to have somewhat of a balance in men and women working at this department, as was said to David:

> *"And what was once said to me is that I had good vocational opportunities. At the moment, it is very advantageous to be male within the training because soon in five years, you will have those 75% women who are also all going into the professional market. And of course, all those departments in hospitals also like it when it is balanced. They don't want to have only women either. So right now, again, it is very favourable to do the training as a man."- David, M2*

Some female participants on the other hand were told that they might need to consider when they would like to start a family, as being pregnant or already having children might hinder them in finding a training spot, as described by Flora:

"What is always said is, for example, you have to get into training first so you have a spot, and only then can you get pregnant. So say you have to make sure you're in first, and only then you can think about expanding your family. Because yes, who wants to hire a pregnant woman in training? [..] So that's also kind of a gender bias, I've never seen a man worry about that, that he thinks 'oh my wife is going to get pregnant', no, he's going to get there anyway." – Flora, M3

Here, differences between the experiences of male and female participants can thus be observed. Male students seem to experience a benefit from their gender whereas it is a downside for female students.

Furthermore, gender differences also exist in experiences in the master education, where the program does not solely consist of lectures but mostly of residency. Here, participants experienced biased attitudes more compared to during the bachelor, especially female participants. Some female participants addressed that they did not always feel taken as seriously as their male fellow students. They felt that their opinions were doubted more than those of male students, as illustrated by Emma.

"I do often have the idea, for example in the clinic, when I'm an intern, that boys are taken much more seriously. Not only by the doctors but also by the patients. I don't know why. [..] We are also treated with respect but, how to put it, they are just taken more seriously. What comes out of their mouths is experienced as true and in the case of a woman there is a bit more of an attitude of distrust, I think. And I sometimes have the feeling that we are portrayed as stupid, I don't really know where that feeling comes from. [..] I sometimes have the feeling that you are underestimated or something" – Emma, M2

One participant even highlighted a surgeon she encountered during her residencies who openly expressed a strongly gender-biased point of view towards female residences. This surgeon influenced the learning process of female residency students in a negative way. Diana said that her and other female residences would rather go to another person at that department as they thought it was more likely that they would be able to learn something:

"Yes, and I also experienced in my training that there really was a doctor in a department who said, this was a surgeon, and he was really of the opinion that 'women cannot become good surgeons'. And actually, none of the female co-assistants also went with him to the OR [Operation Room], to the operations, because then you just knew it wasn't going to be fun anyway. He just expresses himself openly about that. And that then goes around a bit among the residents of course 'like he said this'. You then also hear very different things from people who do their internships at the same time as you. When the

boys come along to the OR they have a great time and when the women come along, they are not allowed to do anything, or he is not nice to them." – Diana, M2

The description of Diana shows that male and female students can have very different experiences relating to gender bias, even at the same department. Another participant mentioned that she had also witnessed negative attitudes from male medical professionals towards a female medical professional, as illustrated by Emma:

"I did an internship in [..], which was very nice from a medical point of view, but in terms of people, it was different. You have senior professors there, and they are pretty conservative people, a bit hierarchical. And then there is a female colleague in the team. And then you have a meeting and her phone rings, for instance during a transfer meeting, and she gets such a rude response. Whereas I think if this had been a man you wouldn't have reacted like that." – Emma, M2

A few other participants brought up the fact that women make up a smaller percentage of professors or department heads. One participant said that a female department had mentioned during a class that it was still rather unique for a woman to become a department head. This potentially indicates that gender-biased attitudes are also still present at the top of medicine and that women might face barriers when striving for a top position, as described by Alex:

"One time, we had a lecture by a woman, and she had become department head. And she also encouraged all the women in the lecture hall incredibly well and said, 'okay ladies it is possible after all, I am department head '. She said, 'it can be done ladies, here is the example, do your best'. That was specifically mentioned and that also really stuck with me. That a woman said that, I thought okay, so obviously that is still an issue, if that needs to be mentioned." – Alex, B3

Overall, female participants experienced more gender biased attitudes from other medical professionals than male participants. These attitudes were mostly mentioned by master students as these predominantly took place in a hospital context.

Gender bias from patients

This section discusses the experiences of participants in relation to gender biased attitudes of patients. In the previous section it could already be observed that one participant mentioned that she felt that she was taken less seriously by both medical professionals and patients themselves. Some other participants also indicated that they experienced a biased attitude from patients in a hospital setting. Male and female participants experienced this bias from patients in a different way.

A few participants mentioned that male students were not always included during their residency in gynaecology. They highlighted that this was quite common, and that male students sometimes spend a large portion of the day waiting in the hallway. This was because male students were requested to leave during an examination of a woman or during birth, as illustrated by Frank:

> *"And now at the gynaecology department, you do notice that people sometimes look up and say: oh, oh, there's a young man. Fortunately, I haven't been sent away yet. But I do know from other male residents that they were turned away during a discussion. Yes, or when there was a physical examination or something." – Frank, M2*

Some female participants highlighted that they also experienced gender biased attitudes from patients. Patients often still upheld traditional views where they assumed the male to be the doctor and the women to be the nurse. This resulted in patients mostly focussing on the men while a woman was talking.

> *"But I have also experienced it the other way round, a gender bias from patients towards professionals. Because when I go in to a patient, for example, or a just beginning doctor comes in with a male intern, patients still look at the trainee as if he is the doctor. I really saw that a number of times. And now also from my own experience, now I'm a bit further on and if I bring in a male intern, they look at him while I'm doing the talking. So it is also still kind of still gender bias, that the doctor is a man and I am then the nurse, so to speak."- Flora, M3*

Here, differences in the way that female and male participants have experienced a gender bias from patients can thus be observed. Some male students were shielded from examining or being present in the room with women when it concerns their reproductive organs. Whereas some female students feel taken less seriously when helping a patient. Here too these experiences were mostly mentioned by master students as these as they took place in a hospital context during a residency.

4.2 Awareness and beliefs

An important factor to take into consideration in this research was students' awareness of gender bias in the medical world specifically. Students' awareness can give an indication of the knowledge that students possess on this topic. As students' awareness interacts with students' beliefs about this topic, this section discusses the interplay of these schemas. This section is divided into *awareness of and beliefs about gender bias* and *reflection on own knowledge*.

4.2.1 Awareness of and beliefs about gender bias

Students' awareness of gender bias was investigated at the beginning of the interview and towards the end of the interview. By doing so, the effect of being presented with information about gender bias later on could potentially be observed. Participants were asked about their awareness on this topic before starting the interview, by asking them what came to mind when they thought about a gender bias in medicine. A few things that were mentioned by participants as something they thought of were the gender division of medicine students, general bias, bias affecting female patients, and heart attack symptoms.

A lot of participants indicated that they thought of the gender division in the medical education when thinking about gender bias. They referred to this because currently a majority of students are female. Participants estimated that around 75% of medicine students is female. A few participants thought of what a gender bias meant in a more general sense. They thought of how gender bias has to do with stereotypes and how these stereotypes can lead us to put people in a box. Some participants said that they thought of gender bias affecting predominantly female patients and others mentioned that they thought about the fact that women have different symptoms when experiencing a heart attack than men do as Frank mentioned:

> *"I always immediately have to think about the, well, if you have a cardiovascular disease, or if you have a heart attack, then men have a different way of presenting than women." – Frank, M2*

The definition of gender bias of Hamberg (2008), used in this research was read out to participants. It states that gender bias refers to the unintended but consistent neglect of women and preconceptions based on stereotypes about their health, behaviour and experiences. Participants were asked whether the situation that it described sounded familiar to them and if they had heard of this before. Most participants better understood what the topic of this research was after hearing this definition. Before hearing this definition most female participants thought of how gender bias in medicine mostly affects female patients, while male participants mostly thought that it concerned the gender division of medicine students. This may indicate that female participants possessed more awareness about gender bias. This could perhaps be explained by the fact that this could also affect themselves and their own bodies, and that information about that is lacking, as Amy also mentioned:

> *"So just that you notice things like 'oh but don't I get to hear anything about my own body here?' How would that be for me?" – Amy, B3*

Halfway through the interview participants were presented with a list of findings and numbers from scientific research on the topic of gender bias, which can be found in *Appendix D*. Participants were asked whether this information was familiar to them or not. Most participants indicated that a lot of this information was indeed familiar to them. They indicated that to some

extent they knew about the situation described on that list. However, most participants had not mentioned these examples when asked about it before. This could be because they now gave a socially desirable answer, saying that they did know about it despite this not being the case. On the other hand, it could also be that this knowledge did not come up immediately when thinking about this topic. The latter also begs the question how deeply rooted this knowledge is and whether or not students have actually been informed about this topic frequently. Several other participants highlighted that not all information was familiar to them and that they did not know about all of this or that at least a few issues on the list were unheard of.

Participants then described what was on their mind after reading the information that they were shown halfway the interview. Some participants indicated that when seeing this information together it was quite a shock and a confrontational sight. They mentioned that the numbers were quite unexpected and startling, and that they were not aware of the problem of gender bias to this degree, as illustrated by David.

> *"Most of it is stuff I was aware of. But what I wasn't so aware of when it says here now that women get a diagnosis of a disease on average 4 years later, I find that a pretty impressive or yes how do you say, a pretty unexpected number. And that also 80% of patients with unexplained health complaints are women, I was also really unaware of that." – David, M2*

Other participants believed it was a shame that women were still disadvantaged in this situation. When participants were asked whether or not they believed the education had provided enough tools to work on this issue as a medical professional later on, most participants felt that this was not the case. The extend and implications of these gender differences were not discussed enough, causing a lack of awareness about that, as illustrated by Eric:

> *"No, I think you do miss some awareness about that. That things are sometimes mentioned or that you hear about them. But I think you don't learn enough about the actual implications of that and what that means for you and for your patients." – Eric, M2*

Other participants highlighted that because of the lack of discussion they don't know what they don't know. They might be incompetent but they are not aware of this, like Flora described:

> *"It's more that it's never been explicitly mentioned or anything like that, so it's never, at least that's how I've never experienced it, that that's really been mentioned like "there are differences in that'. So that's why I don't really know how many differences there actually are. It's like, I don't know if I'm unconsciously incompetent." – Flora, M3*

Other participants mentioned that they did not feel like enough tools were provided for dealing with this as they wouldn't know where to find information on this.

Participants' awareness thus seemed to shape their beliefs about a gender bias. One the one hand, those who knew more about the topic but who did not see this information reflected in the education, believed that the education was gender biased. On the other hand, those who did not know much about this topic, and were confronted with new information, also believed their education to be gender biased. It can be observed here that students' beliefs about gender bias are similar to students reasoning about gender bias. Awareness seemed to differ slightly between male and female participants, where female participants were more aware of what gender bias in the medical context mostly relates to. Regarding beliefs, these differences as such could not be observed, both male and female participants saw the current situation as undesirable. Between master and bachelor students no evident differences could be observed.

4.2.2. Reflection on own knowledge

In this section of the findings the theme *lack of confidence in abilities* becomes evident. Participants were asked to reflect on themselves at the end of the interview. Participants reflected on their own knowledge of male-female differences and whether or not they felt that they possessed enough knowledge on this topic. Most participants indicated that they thought they lacked knowledge.

One participant for example, indicated that he thought that his knowledge was okay but if he was tested on it, he wouldn't perform very well, as illustrated by Benjamin:

> *"If you put a knowledge test in front of me now, I doubt I would score very well. But I think fine yes. If you have a knowledge test with the question 'is this syndrome more common in men or in women?', I would doubt I would have the right answer. But in itself, for example, that MS is more common in women, that I know. But whether I would get a 100% on my test, I don't know." – Benjamin, M1*

A female participant, Bella, indicated that she felt that her knowledge was below the level it should be at, but she hoped it would get better once she was in the master. She had previously stated during the interview that she had felt disappointed in her knowledge as a medicine student as she had learnt about gender differences when a friend had visited a general practitioner. She thought it was odd that she did not know about this previously, while almost having finished her bachelor degree:

> *"And I remember that at one point a friend of mine went to the GP with symptoms that I didn't recognise and then the GP said 'oh but that's how this and this presents in a woman'. And then we were both like, 'hello, we've almost finished our bachelor's, why don't we know that?' You would think that we have a lot of theoretical knowledge already*

and that we mainly still need to learn practical stuff. But yeah, that's not really the case." – Bella, B3

A number of other participants also mentioned that the knowledge they have was scarce and that it mostly did not come from the education itself, as illustrated by Flora:

"I know a few things but that's really purely through news reports, articles or once a conversation with other students that coincidentally came up. So I would say I don't really know a whole lot about it." – Flora, M3

Some participants even mentioned that they learned more about gender differences through medical shows, such as Grey's Anatomy, as illustrated by Celine:

"No, the last time I thought about that was when I was watching Grey's Anatomy. So that wasn't because of my studies no." – Celine, M1

In line with previous statements of participants, two participants described themselves as incompetent, consciously incompetent. This meant that they were aware of their incompetence, which was considered to be frustrating, as described by Diana:

"I always feel a bit consciously incompetent. I know there are, say, these problems, but I know very little additional information about how I can prevent it myself. So, for example knowing how do diseases present differently in women than in men. Things like that, I don't know much about that." – Diana, M2

A few other participants said that this interview had provided them with new knowledge that they previously did not know about. It also made them realise that they know little about this topic, and that there was a lot more information they could learn about.

When participants were asked if they felt that they would be able to treat female patients just as well as male patients, most participants hesitated. They felt that they would treat a female patient with similar respect and attention as a male patient, and that listening to a patient is very important. However, almost all participants did indicate that they might not be able to diagnose or treat patients the same. This is because the knowledge they have on diseases and treatments are based on men, and they would therefore be able to treat a male patient better. As was described by David:

"I think I can diagnose men a little bit better because I just learnt this a bit more that way. Because my education is slightly male-dominated. So I think maybe I can diagnose men a bit better." – David, M2

Here the extent to which the existing gender order had shaped the knowledge of students becomes clear. Some other participants also highlighted that if you don't know what you don't know, it is really hard to do it right. If you do not possess the correct knowledge about gender differences for instance, you cannot take that into consideration during a consultation with a female patient for example. In line with this, another participant, Diana, mentioned that she did not think she could treat women the same, as it is also really hard to find proper information on this. In addition to this, students are very busy and do not have time to delve into this topic themselves, besides their other study work:

> *"No, I definitely don't think so. Because what I said, I don't know those differences very well, I know a few. But also, for example, would I want to find out anything about medication in women, I wouldn't even know how to start looking for information. Much of that might not be there either. But how you could prevent for instance an overdose, I wouldn't know. And I don't have time for that either, maybe very stupid. But you have so little time, I don't also have time to then go and find out where I can find the information." – Diana, M2*

The findings above thus show that most participants lack confidence in their ability to treat female patients as well as male patients, both male and female participants indicated this. These findings were found for both bachelor and master students, indicating that even participants who were almost done with their education were not very confident in their abilities. This thus suggests that the education has not succeeded in providing students with this confidence.

4.3 Reasoning about gender bias in medical education

This research has focussed on students reasoning about a gender bias in their education. This section discusses participants' reasoning about the problem of gender bias and whether or not they reasoned that a gender bias is present in the education. In this section of the findings the themes *lack of recognition of problem of gender bias* and *lack of information sharing about gender differences* become evident. Participants were asked early on in the interview whether or not they thought that a gender bias was present in the medical education, and towards the end of the interview, after discussing this topic for a while, they were asked the same. This section is therefore divided into *reasoning beforehand* and *reasoning afterwards*.

Reasoning beforehand

In the beginning of the interview participants were told the definition of gender bias that is central in this research. Participants were asked, keeping in mind the definition of gender bias, how they felt about a gender bias in their education and whether they thought this was present here. All female participants, and approximately half of male participants indicated beforehand that they felt that a gender bias was present.

Female participants mostly mentioned a lack of information about this gender differences and male dominated information as a reason for this, and said that as a patient your gender still matters a lot. A lot of knowledge is absent about gender differences or not shared in the education, as shown by Bella:

> *"But I think as a patient it still matters a lot whether you are male or female. I think on certain diseases there is just too much focus on how it presents in men and not how it presents in women. And yes, that is also about the use of medication, some mediation is really more likely to be used on a woman than a man, and we just don't get to hear anything about that. I just know almost nothing about that either. Every now and then you hear from the general practitioners, like, oh 'I have seen more effect of this on women, I happen to know that from this and this lecture'. And then you think 'oh really? I don't get any of that at all in my education'." – Bella, B3*

Most male participants had a similar reasoning. They reasoned that gender bias was likely to play a large role in the world of medicine, but that they themselves were not aware of this as this was not brought up in the education. Here a lack of recognition of the problem of gender bias could thus be observed, as illustrated by David:

> *"What I think mainly is that it's not a very big topic within the program. And that there are quite a lot of situations where gender bias is really very much a factor, but I'm not at all aware of that myself." – David, M2*

A few other male participants did not feel that a gender bias was present. Some did not describe a clear reason for this and one male participant said that upon first thought, this definition and the situation this depicted, seemed new to him, it did not ring a bell. Here no differences between bachelor and master students could be observed, all had a similar reasoning.

Reasoning afterwards

At the end of the interview participants were asked again if they felt that a gender bias was present in the education or not. At this time, all participants but one indicated that they felt that a gender bias was present. Both female and male participants described reasons for thinking this.

Most participants mentioned a lack of attention and discussion of this topic as the main reason, as Bella described:

> *"I think mostly in a lack of knowledge about symptoms in women, and a lack of representation of how the female body is different from the male body." - Bella, B3*

Participants point out that differences between men and women are thus not discussed enough in the education. Others also referred to the list of information that they were shown during the interview. One participant, Frank, said that by not discussing such information a gender bias is perpetuated in the education:

> *"Then indeed I think that in spite of all these studies, that this is known, that too little attention is still paid to it, and therefore you perpetuate gender bias." - Frank, M2*

Other male participants, had a slightly different reasoning. David mentioned that he thought that there was in fact a gender bias, but mostly because knowledge was not there yet:

> *"Yes. Still because of the curriculum that is used, because of that you do have a gender bias in terms of presentation of patients and treatment. And I think the education is partly aware of it. As it is sometimes said specifically, for example in the case of endometriosis or heart failure, that there really are differences. So the education also tries to adapt to it, but in certain subjects you just have textbooks, curriculum, where you do not have enough evidence-based research on the differences yet. That this why this is just adhered to. So I do think there is a gender bias, but purely because there hasn't been enough research on it yet." – David, M2*

Lastly, another male participant, Benjamin, felt that there was no gender bias present in the education. As he felt that once the knowledge was there it would be shared:

> *"No, not very outspoken in any case. See that textbooks still have more men in percentage terms than women, I suppose that's true. And that there should be more knowledge about the difference between men and women, I also agree. But I do think that once the knowledge is there, that that does get into the education. So, in that respect, I'm sure there will still be a gender bias, but whether that's in the education, I don't think so." – Benjamin, M1*

Generally, students mentioned the *lack of information about gender differences* and *recognition of the presence a gender bias* throughout which shaped their reasoning that a gender bias was in fact present in their education. The existing gender order in medicine has led to a male dominated curriculum which is not acknowledged or challenged. There were no clear differences that could be observed here between bachelor and master students or male and female participants, as almost all participant had a similar reasoning.

4.4 Participants recommendations

This section will discuss the recommendations that participants mentioned regarding their education. Participants were asked what they thought could be improved in their education in relation to gender bias. Participants did recommendations about the inclusion of information on gender differences, the inclusion of information on patients with different backgrounds and ethnicities and lastly information about transgender patients.

When participants were asked if something could change in their education, all but one participant said yes. Most participants said that they thought gender bias and gender differences should be better integrated in the education. Participant mentioned that being shown an overview of information on gender bias and gender differences in their education, as they had seen during the interview, would already improve students' awareness on this topic. As suggested by Celine:

> *"Yes certainly, in the bachelor's they have to begin to point out differences better, I think that's a very nice improvement anyway. I think it would also be quite nice if people were confronted with this information [the list of information in Appendix D]. People should be aware of that." – Celine, M1*

Participants described various ways in which they thought the topic of gender bias could be implemented more. They suggested that this could be throughout the education by incorporating it at several moments when gender differences are relevant. They also suggested that specific theme weeks could be organised where this topic could be addressed in more detail, as Eric suggested:

> *"I think you could very well do a theme week or something about that. That if you kind of do that at the beginning of the study, a theme week where you create some awareness. And then of course when you discuss disease states in lectures, you can then pay attention to those differences. When you discuss medication, indicate that there can be differences. So I think that in itself you could very well incorporate that into the study. The most important thing is that you first create some awareness about it and then you can share that knowledge effectively." – Eric, M2*

This current research discusses the differences between men and women in healthcare. However, other differences between patients were also brought up by participants as important to look into. Emma highlighted that the current medical professionals could be more representative of the population, as the field currently still is male dominated. The current medical staff does not reflect today's society, as described by Emma:

> *"We don't just have male patients; we have female patients and patients of colour and patients who speak a different language. Then I also think the healthcare professionals should be a reflection of those patients we have." – Emma, M2*

Furthermore, a few participants mentioned that little attention is paid in the education to different ethnicities and backgrounds of patients. They mentioned that textbooks are slowly changing and becoming more inclusive. Previously it was mostly Caucasian men in the books but now the depiction of different skin tones and description of how bodies differ has become more important. They highlighted that things are changing but that there is not a lot of information about it yet. Despite these improvements, according to participants the current education still mainly focuses on individuals with a white skin tone, as Benjamin mentioned:

> *"So not just on men and women but also on different ethnicities, well there's just less research on that, so you have less knowledge about that because you learn less about that." – Benjamin, M1*

Another topic that was brought up by a few participants was that of transgender care. Participants mentioned that although awareness about male-female differences is becoming more common, knowledge on transgenders was still largely absent. This should be investigated further too, as suggested by Alex:

> *"I'm curious what, look we've now talked about man and woman but you also see a lot of people that are not content with if they are woman that they then say I want to become a man and vice versa. I could also add that we need to research how transgender people respond to treatments, so that should actually be taken into account in the future as well."- Alex, B3*

Participants thus highlighted that other differences between patients, besides gender, could also play a more central role in the education. Overall, several recommendations were done by students that would help if implemented to create a more gender sensitive and inclusive curriculum.

5. Discussion and conclusion

5.1 Discussion

This research has aimed to gain insight in medical students' experiences, awareness and beliefs in relation to the medical education context and how these shaped their reasoning about a gender bias in the medical education. Based on the literature study and theories, expectations were formulated about how students perceive their education. A qualitative research approach was used to study this topic, where semi-structured in-depth interviews were conducted with twelve medicine students in Groningen. Investigating gender bias in the medical education from the perspective of students has provided interesting insights into the status of the medical education as students were able to give detailed explanations of their perspectives and experiences. Their perspectives of their education are eminently interesting as these students will be the medical professionals of the future. Gender Order Theory (Maharaj, 1995) and Cultural Schema Theory (Strauss & Quinn, 1997; D'Andrade, 1995) were used as frameworks to make sense of the data that was collected.

According to Gender Order Theory, a gender order can be observed in society and therefore also in the world of medicine (Maharaj, 1995). Throughout the findings this gender order in fact became evident. According to Cultural Schema Theory, the gender order that is present in medicine can be considered a cultural schema as it has shapes the cultural norms and customs, as shown in *Figure 2* in the findings. This male dominated norm has impacted how students perceive their education. The findings showed that participants perceive their education to be gender biased. Four themes played a central role in shaping students reasoning about this gender bias, being: (1) lack of information sharing about gender differences (2) lack of recognition of problem of gender bias (3) gender biased attitudes and lastly (4) lack of confidence in abilities. Here, the first two themes were most often addressed by participants. How these themes shaped their reasoning, will be elaborated in the following sections.

First, the findings showed that participants experienced a *lack of information sharing about gender differences* in their education. They perceive their education as mostly relating to the standard patient, which is a man. According to participants, this applied to both knowledge that was presented during teaching moments and the medical textbooks, which highlights the existing gender order. Because of this, participants were able to mention only a few instances where gender differences played a role, whilst in reality this is a lot more common, thereby indicating a lack of awareness. According to participants, the discussion of sex and gender differences was thus, except for some examples, not extensive. Because of this, participants considered the current practices in the education to be perpetuating the existing gender bias. These findings are in line with the expectation based on previous quantitative studies, where students had indicated that sex and gender differences were not discussed to a sufficient degree (Jenkins et al., 2016; Kling et al., 2016 & Miller et al., 2012). However, this present study showed that according to participants, even gender differences that are quite broadly discussed in

academic studies and the media, such as heart attack symptoms, were not consistently integrated in the curriculum.

Secondly, the findings showed that students experienced a *lack of recognition of the problem of a gender bias* in their education. Gender bias as such is not a topic that is addressed and discussed according to students. According to participants, in some instances the male body being the norm in medicine was addressed, but the possible implications thereof were not discussed by teachers, such as delayed or incorrect diagnosis, overdosage of medication, et cetera. By not problematising the existing gender order, the male norm thus seemed to prevail in education. These findings too can be linked to previous quantitative studies, that found that the curriculum was male dominated (Samulowitz et al., 2018; Jenkins et al., 2016; Zelek et al., 1997). However, a finding that was not anticipated was that transparency about the issue of gender bias and acknowledgement of how this gender bias has affected their curriculum was important to students. Furthermore, as participants felt that the consequences of this gender bias on patients were also not discussed to a sufficient degree, this indicates that students consider it important to address the issues at stake.

Thirdly, the findings showed that participants' experienced *gender biased attitudes*. According to participants, they encountered these attitudes far more often in hospital context than in the formal education at the university, therefore these experiences were particularly addressed by master students. Here, according to participants, biased attitudes from both other medical professionals and patients favoured male students and male patients whereas negative attitudes were directed towards female students and female patients. Regarding this theme, participants gender and study year thus shaped their experiences. These finding links to previous studies that found that female students are more often negatively affected by gender biased attitudes, often in a hospital context (Brown et al, 2020; Hansen et al., 2019; Parker et al., 2016; Wear & Keck-McNulty, 2004). This too can be explained by the existing gender order in medicine which can contribute to differences in treatment between men and women and cause inequalities. However, the present study has provided up to date information about how female students experience such attitudes. It also highlighted two other kinds of biases that were not anticipated, those are, gender biased attitudes relating to finding a training spot and biased attitudes from patients towards medical professionals.

Lastly, as a consequence of a lack of information on gender differences and discussion of gender bias, participants indicated that they lacked confidence in their abilities as a medical professional, where the theme *lack of confidence in abilities* could thus be distinguished. The findings showed that participants either lacked awareness to some degree or had gathered more awareness of gender bias outside of their education. Participants therefore believed their education had not succeeded in providing them with enough tools to handle these issues as a future medical professional. This negatively shaped their confidence in their abilities as a medical professional to treat all patients equally, and particularly female patients as well as male patients, as they believed they were not able to do so properly. This lack of confidence they felt, can be seen as problematic as it indicates that students do not feel confident about their knowledge, despite

this being vital for carrying out their profession. These findings are in line with expectations based on previous study that found that students felt that their education had not provided them with enough information (Jenkins et al., 2016) and that knowledge on this topic could come from outside of their education (Verdonk et al., 2008). However, the present study provided in-depth understanding of how this shaped students' confidence in their abilities.

5.2 Strengths and limitations

A strength of this study is the use of a qualitative research method to obtain a deeper understanding of how medicine students perceive their education. Because of this, this study adds to existing research on students' opinions on their curriculum in relation to a gender bias. It has provided detailed explanations and examples of how students saw this gender bias manifest, which is valuable information from which lessons can be drawn. Although saturation has to some extent been reached after 12 interviews, this is a relatively small sample. In further research it may be interesting to see how a broader range of students feel about their educational experiences in relation to a gender bias, different or new observations could perhaps be done. Another strength however, is the inclusion of both male and female participants as this has made it possible to make a gendered comparison between participants. This study has only focused on one medical education in the Netherlands and it should therefore be noted that different results may be observed at other medical educations in The Netherlands and beyond. A positive aspect of this study is that participants were asked about their own views on how the education system could be improved for the better. This is valuable information that can be of interest to others, outside of the education system in Groningen too. These recommendations can function as a measuring point for other education systems to see whether they have implemented such measures yet and if not, what students themselves think could help to do so.

5.3 Conclusion

This study aimed to answer the following research question: *How do the experiences, awareness and beliefs of medicine students in Groningen shape their reasoning about a gender bias in their education?* It is foremost important to state that students reasoned that their education was gender biased. Experiences, awareness and beliefs shaped students' reasoning about this gender bias in their education in different ways. The lack of discussion about gender differences and a lack recognition of gender bias and its consequences, created a lack of awareness about these issues for participants. Additionally, because of this lacking awareness students were not confident in their abilities to treat particularly female patients adequately. In addition to this, students' experiences with gender biased attitudes and comments, that were mostly directed towards female patients and female medicine students, made them reason that a gender bias is present. Based on the finings it is concluded that the interplay of the issues discussed here made participants feel that their education and the content of the curriculum were gender biased. This study thus provided up to date information about the status of one of the medical education programs in The Netherlands through the eyes of their own students.

5.4 Implications and recommendations

The findings of this study suggest that students' reasoning about gender bias is largely shaped by the fact that not enough information about sex and gender differences and gender bias is highlighted in their education and that students hear or see and experience biased behaviour themselves. The perceptions of the participants show that the medical education has not succeeded in providing sex and gender inclusive education. As the UMCG has expressed the wish to become a frontrunner in knowledge development about gender differences (UMCG,2023), this may suggest that the UMCG would be open to make adjustments in their curriculum to boost this knowledge development of future medical professionals. This open attitude and encouraging culture likely will enhance the implementation of such adjustments (Van der Meulen et al., 2017).

A critical look at the curriculum and learning materials is required, to see where important information currently still is lacking and should be incorporated. This also applies to information about health differences relating to different ethnical backgrounds and transgenders. Students themselves have recommended that such information could be shared at the beginning of the education, though lectures or through a specific theme week. However, specific courses could also be taught about this topic, as this is something that is already being done in other medical programs in The Netherlands (Van der Meulen et al., 2017). Other programs have also incorporated sex and gender-based knowledge in the learning outcomes of the program, thereby emphasising its importance. In addition to this, as stated before, the book S*ex- and gender sensitive medicine* showcases several areas where gender differences in health play a large role (Lagro-Janssen et al., 2023). This demonstrates that it is not necessarily so that knowledge is not there yet, it currently is just not shared to a sufficient degree. It would be very beneficial if information like this on sex and gender differences was included in the mandatory content of the curriculum. The implementation of such measures emphasises the importance of this topic and likely improves students' knowledge about this.

Lastly, a cultural shift in the world of medicine is required where the inclusion of gender sensitive information and a gender bias free curriculum are no longer seen as an option but a necessity. As emphasised by others, this requires funding for more research into gender differences and for sustaining existing programs fostering the incorporation of such knowledge (Wijkhuijs, 2021). This cultural change also relates to the instances of gender biased attitudes that participants reported in a hospital context. These attitudes can have detrimental effects on patients and personnel and should no longer occur. To conclude, this study has demonstrated in further detail what other researchers have also addressed already; the medical education is an institution that perpetuates gender bias. It is time for action, as all patients deserve the healthcare and treatment they need.

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Appendix A - Data management plan

Table 2: Data management plan

Use of data	What data	How?
Contact	Name, email address and phone number	Contact with participants was done using WhatsApp, LinkedIn or the email address from the University of Groningen. Information about participants that was necessary for contact during the research is stored on a Google Drive on this same account. This account can only be accessed through two-way verification. I first need to fill in my personal password and after this an authenticator code that I have on my phone which is also protected by a personal password. The conversations that took place on WhatsApp are archived and a two-step verification is installed, requiring a password to access WhatsApp, and the phone itself also is protected by a personal password. Once the research is completed this data will be deleted from WhatsApp, LinkedIn, Google Drive and the student email.
Consent	Autograph	Participants were asked to give written consent by which they are asked to sign the form with their personal autograph. These will be stored in a physical folder for 1 year.
Transcribing	Audio recording	Participants were asked to consent to an audio recording of the interview. The audio was recorded using my phone which is secured using a personal password. Cloud back-ups of recordings were turned off. Once the interview was completed this audio recording was uploaded to the Google Drive from my university account. The audio recording was then deleted from my phone immediately. This audio recording was used to transcribe the interview. During the transcribing any personal information has been withheld from the transcript. Once the transcript was completed the audio recording was deleted from the Google Drive.
Approving of transcript and receiving final thesis	Name, email address	In case participants indicated that they would like to receive the transcript of their interview I stored their names and email address on my Google Drive. If they provided me with any comments after the interview, these were incorporated or altered in the transcript. Once the research is completed the final thesis will be sent via email to those participants that indicated that they would like to receive it. Once this is done, this data will be deleted from both the Google Drive and the email.

Appendix B - Information form in Dutch

Beste deelnemer,

Mijn naam is Nynke Veenstra en ik volg de master Population Studies aan de Rijksuniversiteit Groningen. Ik ben momenteel bezig met het schrijven van mijn masterscriptie omtrent het onderwerp: *gender bias in de geneeskunde opleiding*. Voor dit onderzoek interview ik geneeskunde studenten aan de Rijksuniversiteit Groningen uit verschillende jaren en zowel man als vrouw, om vanuit hun perspectief te horen over dit fenomeen. Dit formulier zal meer informatie geven over het onderzoek.

Het onderzoek

Uit verschillende onderzoeken en recente artikelen van de NOS bleek dat er binnen de geneeskunde nog kennis ontbreekt over het lichaam van de vrouw. Er schijnt sprake te zijn van een gender bias. Aangezien kennis van artsen veelal wordt bijgebracht tijdens hun opleiding, wil ik graag geneeskunde studenten interviewen om hen te vragen hoe zij naar hun opleiding kijken en of zij het gevoel hebben dat er sprake is van een gender bias.

Het interview

Het interview zal plaatsvinden op een locatie van de Rijksuniversiteit Groningen. Het interview zal ongeveer 60 minuten duren. Ik zal in het interview vragen stellen over jouw opleiding en hoe jij dit tot dusver hebt ervaren. Als je hiervoor toestemming geeft neem ik het interview op zodat ik deze later uit kan werken. Je deelname is volledig anoniem en ook in de uitwerking van het interview zal ik alle persoonlijke informatie weglaten. De geanonimiseerde teksten zal ik analyseren en de resultaten gebruik ik voor mijn scriptie. Enkel ik en mijn twee scriptiebegeleiders zullen toegang hebben tot deze tekst. Wel kunnen er geanonimiseerde quotes in het onderzoek gebruikt worden.

Indien je geïnteresseerd bent in meedoen aan het onderzoek neem dan contact met mij op via het volgende emailadres: n.l.veenstra.1@student.rug.nl

Met vriendelijke groet,

Nynke Veenstra

Appendix C - Consent form in Dutch

Beste deelnemer,

Dit toestemmingsformulier betreft het onderzoek: *Gender bias in the medical education: Perspectives of medicine students in Groningen on their curriculum*. Met het ondertekenen van dit formulier geef je aan onderstaande gelezen te hebben en toestemming te geven tot deelname aan het onderzoek.

De participant ..

- geeft toestemming tot deelname aan het onderzoek.
- neemt vrijwillig, vrij van dwang, deel aan dit onderzoek.
- is op de hoogte van het feit dat deelname aan het onderzoek volledig anoniem is en dat de resultaten van het onderzoek niet herleid kunnen worden aan de participant.
- is op de hoogte dat hij/zij op ieder moment tijdens het interview of elke fase van het onderzoek kan aangeven zich/haar terug te trekken.
- is op de hoogte dat hij/zij op ieder moment tijdens het interview kan aangeven een vraag niet te willen beantwoorden.
- geeft toestemming tot een audio opname van het interview voor het uitwerken van het interview, waarna deze verwijderd zal worden.
- geeft toestemming tot het opslaan van de data op de drive van de Rijksuniversiteit Groningen waartoe enkel Nynke Veenstra en haar scriptiebegeleiders toegang tot hebben.
- geeft toestemming voor het gebruiken van de data in de masterscriptie van Nynke Veenstra.

In tweevoud ondertekend:

Datum: _____
Plaats: _____

Onderzoeker Deelnemer

Appendix D - Interview guide in English

Welcome! First of all, thank you very much for wanting to participate in my research.

Introduction

As you already know, this research is about gender bias in the medical school in Groningen. I am very curious about your experiences and perspective on the curriculum and training in general and would love to discuss this with you.

Informed consent

Ask whether the consent form has been read through and signed. If this is the case briefly repeat the following.

Here I will briefly repeat the following, you may indicate at any time during this interview that you want to stop or that you do not want to answer a question. I would also like to ask you whether you do indeed give permission for a sound recording to be made?

Background questions

I will now start with a few background questions. I would first like to learn a bit more about you.

1. Can you tell me something about yourself?
    a) What is your age?
    b) What year of the programme are you currently in?
    c) How many study credits do you currently have?
    d) What is your gender?
2. What do you like to do besides your studies?
    a) Hobbies / sports / work / student life?

Rapport

3. Why did you start studying medicine?
4. Is this study what your expected it to be like?

Education - general

5. Can you briefly describe how the education is structured?
    a) How many hours do you have lectures in a week?
    b) How much time do you spend on a theme?
    c) Can you describe what form of education you are usually taught in?
        - Do you mainly have lectures or working groups?
    d) How big are the groups you are taught in?
6. Who is your favourite teacher you have had so far?
    a) Why is he/she your favourite teacher?
    b) Is it a man or a woman?

c) What is his or her age approximately?
d) What background does this teacher have?

7. Can you describe what kind of teachers you have in general?
    a) How is the division of male/female?
    b) What does the age division look like?
    c) Do these divisions differ for different specialisation areas?

Gender bias - awareness

This study is about gender bias in medical education.

8. What comes to mind when you think of a gender bias within medicine? *
    a) Do you know what is meant by gender bias?
    b) Have you ever heard about this?
    c) Where have you heard about this?
    d) Are you familiar with this being 'a thing' within medicine?
    e) Is this a subject you find important?

**After the first response of the participant the definition of gender bias is read out to the participant to emphasise the focus of this research. The definition is: the unintended but consistent neglect of women and preconceptions based on stereotypes about their health, behaviour and experiences. This means that female patients more often have negative health outcomes than male patients.*

9. How do you feel about a gender bias in relation to your education?
    a) Do you feel that there is a gender bias here?

Gender bias - experience

10. Is gender bias discussed during lectures or working groups, and if so how?
    a) Is (much) attention paid to this topic?
    b) Is it explicitly mentioned that a gender bias is present or is it implicit?
11. During the education so far, what has been told about differences between men and women when it comes to their bodies or illnesses?
    a) How was this information presented?
    b) How much time was / is spent on this topic?
    c) In which year of study was / is this topic discussed?
    d) Are any subjects taught specifically about differences between men and women?
12. What is discussed about female-specific diseases?
    a) How are diseases/processes such as endometriosis and menopause discussed?
    b) How much attention is paid to this?
    c) Is the broad range of health complaints that menopause can cause discussed?
    d) Are possible treatments such as hormone therapy for menopause discussed?
13. What kind of patients usually come to patient lectures?
    a) Are patients with gender-specific health issues included?

b) Are differences in disease image and progression discussed in the lecture prior to or after this patient lecture?

14. How are patients discussed within the training? Are there differences in how men and women are discussed?
    a) Are female patients taken just as seriously?
    b) Are female patients seen as more emotional?
15. What do you think of the content of the study material when it comes to gender differences?
    a) Do these books regularly provide information about differences between men and women?
    b) How is this information presented?
        - Are women mentioned after men? Or as a deviation from men?
16. To what degree do you think the anatomical images in the study material show a gender bias?
    a) Are these mostly men's bodies or also women's bodies?
    b) Do these offer a representative picture?
17. What are your own experiences with gender bias?
    a) Have you yourself ever felt treated differently because of your gender?
    b) How did this affect you?

<u>Gender bias - opinion</u>

Now I would like to address some information and numbers from scientific research about gender bias in medicine. I would like to ask you to read this information (final page of interview guide)

** Once the participant has finished reading the information, the following questions will be asked.*

18. Can you share what is on your mind after reading this?
    a) What kind of imagine does this information paint?
19. To what degree do you feel that this was information you were familiar with?
    a) Does the education pay enough attention to this in your opinion?
    b) Is this information given in textbooks? Or discussed in lectures?
20. What is the cause of the findings from these studies according to you?
    a) What do you think is at the basis of this?
    b) Is the medical education contributing to this?
21. What is the effect of this according to you?
    a) Does this contribute to the inequality in health between men and women?
22. How do you feel at this moment about your knowledge on differences between men and women?
    a) Do you feel that you have been given enough tools from the education?
    b) Do you think that you would be able to treat female patients as well as male patients as a medical professional?
    c) What would you like to learn more about?

23. Do you feel that there is a gender bias within the education, and if yes in what way?

Education - recommendations

24. In your opinion, should something change in the education and if so, what?

    a) What are you currently missing in your education?
    b) In your opinion, where is too much or too little attention paid to?

Completion

25. Are there any other things about this topic that were not discussed but that you think are important to still discuss?

26. Do you have any questions as a result of this interview?

27. Do you know any fellow students I could possibly talk to as well?

28. Would you like to receive the transcript of this interview afterwards?

29. Would you like to receive the finished thesis afterwards?

This is the end of the interview, thank you very much for participating!

Information and numbers on gender bias in medicine

Below, findings and numbers from several publications and scientific studies are presented.

- For nearly 700 diseases, women receive a diagnosis on average 4 years later (Westergaard et al., 2019).
- 80% of patients with unexplained health issues is female (Kaijer, 2021).
- Women live longer, but in poorer health (Kennisagenda Gender en Gezondheid, 2015).
- Because women have different symptoms when experiencing a heart attack, and knowledge about this is lacking, women are often not correctly diagnosed (NOS, 2018; Maas, 2015).
- Women more often are taken less seriously when discussing their health issues with medical professionals (Hoffman, Fillingim & Veasley, 2022; Samulowitz et al., 2018).
- Women more often have more serious and longer persisting physical issues, yet they are diagnosed 6% less. They also receive fewer referrals to as specialist or for a physical examination (Ballering, A. V., Rosmalen, J. G., & olde Hartman, T. C., 2022).
- Women experience side effects of medication almost twice as often as men do (Zucker & Prendergast, 2020; Nowogrodzki, 2017).
- The lack of knowledge about the effects of medication on the female body can lead to an overdose of medication (Zucker & Prendergast, 2020).
- A lot is unknown about the symptoms that can and cannot be ascribed to menopause (Bendien et al., 2019).
- Less funding is made available for research into diseases that are more common among women (Mirin, 2021).
- When anatomical images of gender-neutral body parts are depicted, male bodies are depicted three times more often than female bodies (Criado-Perez, 2019).
- In medical textbooks the male body is considered as the norm and women are underrepresented or solely mentioned when it concerns reproductive organs or processes (Parker, Larkin & Cockburn, 2017).
- In 2022 the percentage of female professors in training hospitals in The Netherlands was 29,7%, and 21,3% of department heads was female (Women Professors Monitor, 2023).

Appendix E - Codebook in English

Table 3: Final codebook with deductive, inductive and in vivo codes

Legend – theme's				
1: Lack of information sharing about gender differences				
2: Lack of recognition of problem of gender bias				
3: Gender biased attitudes				
4: Lack of confidence in abilities				
Concept	**Theme**	**Code**	**Type**	**Description**
Participant		Age participant	Deductive	Student mentions their age
		Study points / study year participant	Deductive	Student mentions in which study year they are in and /or how many study points they have
		Gender participant	Deductive	Student mentions their gender
		When medicine	Deductive	Student mentions when they knew they wanted to study medicine
		Reason medicine	Deductive	Student mentions reason why they wanted to study medicine
		Experience medicine	Deductive	Student mentions what they think of medicine so far
		Besides medicine	Deductive	Student mentions what they do besides their studies
Education		Class day	Deductive	Student describes what a day of class looks like
		Education structure	Inductive	Student describes the way the education is structured
		Course	Deductive	Student mentions a name of a course
		Education form	Deductive	Student mentions form of education
		Group size	Deductive	Student mentions group size of classes
		Class hours	Deductive	Student mentions something about (number of) class hours
		Internship /residency	Inductive	Student describes something that happened during their residency
		Hospital department	Inductive	Student describes something about a hospital department
Teacher		Professor	Deductive	Student mentions whether teacher is a professor or if they have a different title
		Age teacher	Deductive	Student estimates age of teacher
		Gender teacher	Deductive	Student mentions gender of teacher
		Background teacher	Deductive	Student mentions background of teacher
		Favourite teacher	Deductive	Student describes who their favourite teacher was
		Male-female teachers	Inductive	Student describes the male-female division among teachers
		Ages teachers	Inductive	Students describes the age division among teachers
		Specialisation teachers	Inductive	Student describes whether differences in divisions can be observed in some specialisations

Awareness	4	Gender bias meaning	Deductive	Student discuss what they think of when hearing the term gender bias
	4	Definition gender bias	Deductive	Student responds to definition of gender bias
	4	Thoughts definition	Inductive	Student mentions what they think of when hearing definition of gender bias
		Reason awareness	Deductive	Student mentions why or because of what they are aware of gender bias
Gender bias	2	Education about gender bias	Deductive	Student mentions how gender bias is discussed in education
	2	Explicit gender bias	Deductive	Student mentions that gender bias is discussed explicitly in education
	2	Implicit gender bias	Deductive	Student mentions that gender bias is discussed implicitly in education
	2	Attention gender bias	Deductive	Student describes how much attention is paid to gender bias
	2	Male norm	In vivo	Student mentions that the male body is seen as the norm
Gender differences	1	Gender differences	Deductive	Student describes how gender differences are discussed
	1	Information gender differences	Deductive	Student describes how information on gender differences is presented
	1	Heart	Inductive	Student mentions the example of heart diseases when discussing differences between men and women
	1	Time gender differences	Deductive	Student describes how much time is paid to discussing gender differences
	1	Course gender	Deductive	Student mentions whether there are specific courses on gender or gender differences
	1	Prevalence	In vivo	Student mentions that prevalence of a disease for men and women is mentioned
		Female diseases	Deductive	Student describes how women diseases are discussed
		Attention female diseases	Inductive	Student described how much attention was paid to female diseases
	1	Knowledge from TV show	In vivo	Student mentions that knowledge on gender differences came from a medical TV show
	2	Gender order	Inductive	Student describes a situation in which a gender order can be observed in which men are the dominant gender
Patients	3	Patient discussion	Deductive	Student describes how patients are discussed in education
	3	Patient's gender	Deductive	Student describes whether female and male patients are discussed differently
	3	Patients seriously	Deductive	Student describes whether female patients are taken as seriously as male patients
	3	Patients biased	Inductive	Student mentions that a patient held a biased attitude against them
Patient-lecture		Diseases patient-lecture	Deductive	Student describes what kind of patients are in patient-lectures

		Gender-specific patient-lecture	Deductive	Student describes how gender-specific issues are discussed in patient-lectures
		Gender differences patient-lecture	Deductive	Student describes how gender differences are discussed in patient-lectures
Study material	1	Medical textbooks	Deductive	Student describes what they think of medical textbooks
	1	Gender differences medical textbooks	Deductive	Student describes how gender differences are discussed in medical textbooks
	1	Gender discussion medical textbooks	Deductive	Student describes how women and men are discussed in medical textbooks and whether women are mentioned as an abnormality
	1	Anatomic images	Deductive	Student describes what they think of anatomic images
	1	Gender anatomic images	Deductive	Student describes whether mostly female or male bodies are depicted in anatomic images
	1	Anatomic images representative	Deductive	Student describes whether anatomic images give representative image
Experience	3	Own experience	Deductive	Student describes how they have experienced gender bias during education
	3	Biased attitudes in hospital	Inductive	Student describes that biased attitudes are more prevalent in hospital setting
	3	Training spot	Inductive	Student mentions their chances of obtaining a training spot
	3	Gender differences personal experience	Inductive	Student mentions that students of different genders have different experiences
Thoughts on information	4	Thoughts information	Deductive	Student describes their thoughts after reading information
	4	Image information	Deductive	Student describes what kind of picture this information paints for them
	4	Knowledge information	Deductive	Student describes whether or not they are aware of this information
	4	Source of knowledge	Inductive	Students describes where they had obtained knowledge on gender bias
	4	Attention education	Deductive	Student describes how much attention is paid to this kind of information in the education
		Cause information	Deductive	Student describes what they think is the cause of the findings from the list
		Effect information	Deductive	Student describes what they think is the effect of these findings
		Role education	Inductive	Student describes which role the education plays in their knowledge on this topic
	4	Opinion knowledge	Deductive	Student describes whether they think they have enough knowledge about gender differences

	4	Tools education	Deductive	Student describes whether they think they have been provided with enough tools to work without gender bias
	4	Equal treatment	Deductive	Student describes whether they feel that they can treat female and male patients equally
		Learning more	Deductive	Student describes where they would like to learn about more
Recommendations		Change education	Deductive	Student describes what should change in the education according to them
		Missing education	Deductive	Student describes what is missing in education according to them
		Ethnicity	Inductive	Student mentions that ethnicity is something that is also not broadly discussed in education
		Transgender	Inductive	Student mentions that transgender care is something that is also not broadly discussed in education
		Attention education	Deductive	Student describes where they feel that too much or too little attention is paid to
Finishing		Important	Deductive	Student mentions something they thought was important
		Questions	Deductive	Student asks question based on interview
		New participant	Deductive	Student mentions possible new participant