PNN PhD Survey

Asking the relevant questions

Mental wellbeing
Workload
Burnout
Research environment
Progress of the PhD project
Considering to quit

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Summary

Mental wellbeing

- 47.1% of the PhDs have an increased risk of developing a psychiatric disorder. Only 20.1% of the PhDs does not show any symptoms of mental health problems.

- However, when asked to rate their mental health themselves, only 11.3% of the PhDs rate their general mental health as poor or very poor. 58.8% rate their mental health as good or very good.

- The worse PhDs rate their general mental health, the more symptoms of mental health problems they show. Even PhDs who rate their mental health as very good have on average 1.5 symptoms of mental health problems.

- 55.6% of the international PhDs is at risk of developing a psychiatric disorder. For non-international PhDs, this is 41.6%. International PhDs also rate their general mental health worse than non-international PhDs.

Workload

- 62.9% of the PhDs works more than they should according to their PhD agreement. On average, PhDs work 4.4 hours per week more than they should according to their agreement.

- PhDs in UMCs relatively most often work overtime, with 81.7% of them working more than they should according to their agreement. On average, they work 6.4 hours more than required.

- 59.6% of the PhDs think the workload of their PhD project is high or too high. Only 2.4% of the PhDs think the workload is low or too low. There are no differences between subgroups in the assessment of the workload: the workload is universally rated as high.

- 95.2% of the PhDs who experience a high or too high workload is at least somewhat bothered by a high workload. 34.4% of them is considerably bothered by a high workload and 8.3% is extremely bothered by a high workload. The higher the workload, the more it affects PhDs.

- Women are more affected by a high workload than men, as are scholarship PhDs and PhD in the Humanities.

- The amount of work, perfectionism and pressure to publish are the most common reasons for a high workload.

Burnout

- 38.8% of the PhDs shows severe symptoms of burnout. The higher PhDs rate their workload, the higher the risk of severe burnout symptoms: of the PhDs who rate their workload as high, 45% shows severe symptoms of burnout, for PhDs who rate their workload as too high, 66.7% shows severe symptoms of burnout.

- Women more often show severe symptoms of burnout than men (40%), as do scholarship PhDs (43.6%) and international PhDs (44.5%). PhDs at UMCs relatively less often show severe symptoms of burnout (31.1%).

Research environment

- On a scale of 1 to 7, PhDs rate the academic relationships in their research environment a 5.31, the personal relationships in their research environment a 4.83, and their sense of belonging in their research environment a 5.22. Overall, PhDs rate their research environment a 5.08 on a scale of 1 to 7, indicating they are moderately positive about their research environment.

- PhDs in universities rate their research environment lower than PhDs in UMCs and other types of institutions, as do external PhDs, international PhDs and PhDs in Law and the Humanities.

Progress of the PhD project

- 27.4% of the PhDs do not think they will finish their project in time, and another 19.5% think they might or might not finish in time.

- The longer the total project duration, the more likely PhDs are to think they will be able to finish in time: only 37.9% of the PhDs with three-year projects think they will be able to finish on time, while 55% of the PhDs who have a four-year project think they will be able to finish on time.

- The further on PhDs are in their project, the less likely they are to think they will be able to finish in time: 71.8% of the first-year PhDs think they will be able to finish in time, while this is only 41.6% for fourth-year PhDs.

- The most common reasons for experiencing delays are many practical setbacks, too tight planning and side projects. Several PhDs also mentioned COVID-19 as a reason for expecting a delay.

- The PhDs who do not think they will finish in time most often need up to six months (43%) or between six to twelve months (43%) extra to finish their projects. PhDs at UMCs, scholarship PhDs and PhDs in Law relatively often expect to need more than six months to complete their projects.

Considering quitting

- 41.6% of the PhDs has at least sometimes considered to quit their PhD projects. 6% very often considers to quit.

- Women more often have ever considered to quit their PhD project (44.4%), as do PhDs at universities (45.3%), external PhDs (48.7%), international PhDs (46.5%) and PhDs in Technical sciences and engineering (56.5%).

- 57.3% of the PhDs who have ever considered to quit, did so because of doubts about academia. For the total group of PhDs, this means that 24% of the PhDs have considered to quit because they have doubts about academia.

- Other common reasons to quit are not enjoying the work anymore (56%), doubts about their own ability to finish (51.6%) and problems concerning supervision (39.3%).

- 30.6% of the PhDs who have ever considered to quit did so because of mental health problems. For the total group of PhDs, this means that 12.8% of the PhDs have considered to quit because of mental health problems.

- Scholarship PhDs who ever considered to quit relatively often did so because of financial problems (34.7%).

Recommendations

- Remove the stigma of mental health problems and burnout in academia. Too often, mental health problems and struggles with the high workload of PhD projects are downplayed by supervisors. Such behaviour only aggravates existing mental health problems or work pressures. Given the huge number of PhDs who are dealing with mental health problems to some extent, universities, UMCs and research institutions should acknowledge these problems and discuss these issues openly.

- Appoint PhD psychologists, specialized in the circumstances and experiences of PhDs. As the position of PhDs is substantially different from the position of students, opening up student psychologists to PhDs is not sufficient.

- Inform PhDs, especially international PhDs, about ways to get help when they experience mental health problems or work-related stress. This information should be part of the introduction information that PhDs get at the start of their trajectories, as well as be easily findable within the institution's network.

- Train supervisors to supervise constructively, preventing supervisors from causing (further) mental health problems or increase the work pressure too much. In addition, supervisors could also be trained to recognize mental health problems or burnout symptoms, so they can intervene in time before problems get out of hand.

- However, PhD supervisors are also experiencing high workloads themselves.[1] When supervisors are stressed themselves, it is likely that this will affect their PhDs as well. Therefore, universities, UMC's and research institutions should aim to reduce work pressure at all levels of academia, by providing all academics sufficient time to do research, by realistically estimating how much time is involved for teaching and teaching preparations, and by giving all PhD supervisors sufficient time to supervise. Solutions require political will and sufficient financing.

- Give PhDs sufficient time to complete their PhD project. The shorter the PhD project, the more PhDs think they are not able to finish in time. The standard of PhD projects of four years full-time should be applied structurally.

- Implement the new system of Recognition and Rewards[2] for PhDs as well. Publication pressure is one of the main causes of high work pressure amongst PhDs, but the number of publications by itself is not a valid measure of PhD quality. Removing this publication pressure and focussing on quality rather than quantity may help reduce the high work load and stress experienced by PhDs.

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[1] Rathenau (2020). Balans van de wetenschap 2020. [Balance of academia 2020].
https://www.rathenau.nl/nl/vitale-kennisecosystemen/balans-van-de-wetenschap-2020
[2] VSNU, NFU, KNAW, NWO & ZonMw (2019). Room for everyone's talent: towards a new balance in the recognition and rewards of academics.
https://www.vsnu.nl/files/documenten/Domeinen/Onderzoek/Position%20paper%20Room%20for%20everyone%E2%80%99s%20talent.pdf

Samenvatting

Mentaal welzijn

- 47,1% van de promovendi heeft een verhoogd risico op het ontwikkelen van een psychiatrische stoornis. Slechts 20,1% van de promovendi vertoont geen enkel symptoom van mentale gezondheidsproblemen.

- Als promovendi echter wordt gevraagd hun eigen mentale gezondheid te beoordelen, geeft slechts 11,3% aan hun mentale gezondheid als slecht of zeer slecht te beoordelen. 58,8% van de promovendi beoordeelt hun mentale gezondheid als goed of zeer goed.

- Hoe slechter promovendi hun eigen gezondheid beoordelen, hoe meer symptomen van mentale gezondheidsproblemen ze hebben. Zelfs promovendi die hun mentale gezondheid als zeer goed beoordelen hebben gemiddeld nog 1.5 symptoom van mentale gezondheidsproblemen.

- 55,6% van de internationale promovendi heeft een verhoogd risico op het ontwikkelen van een psychiatrische stoornis, terwijl dit voor niet-internationale promovendi 41.6% is. Internationale promovendi beoordelen hun mentale gezondheid ook slechter dan niet-internationale promovendi.

Werkdruk

- 62,9% van de promovendi werkt meer dan ze zouden moeten volgens hun promotieovereenkomst. Gemiddeld werken promovendi 4,4 uur per week meer dan ze zouden moeten volgens hun promotieovereenkomst.

- Promovendi in Universitair Medische Centra werken relatief het meest over, aangezien 81,7% van hen meer werkt dan ze zouden moeten volgens hun promotieovereenkomst. Gemiddeld genomen werken zij 6,4 uur meer dan overeengekomen.

- 59,6% van de promovendi vindt de werkdruk van hun promotieproject hoog of te hoog. Slechts 2,4% van de promovendi vindt dat de werkdruk laag of te laag is. Er zijn geen verschillen tussen subgroepen in hun beoordeling van de werkdruk: de werkdruk is in iedere groep even hoog.

- 95,2% van de promovendi die een hoge of te hoge werkdruk ervaren wordt op zijn minst enigszins gehinderd door een hoge werkdruk. 34,4% van hen wordt aanzienlijk gehinderd door een hoge werkdruk, en 8,3% wordt extreem gehinderd door een hoge werkdruk. Hoe hoger de werkdruk, hoe meer het promovendi hindert.

- Vrouwen worden sterker gehinderd door een hoge werkdruk dan mannen, net als beurspromovendi en promovendi in de Geesteswetenschappen.

Burn-out

- 38.8% van de promovendi vertoont ernstige symptomen van burn-out. Hoe meer werkdruk proomovendi ervaren, hoe hoger het risico op ernstige burn-outsymptomen wordt: van de promovendi die hun werkdruk als hoog bestempelen vertoont 45% ernstige burn-outsymptomen, van de promovendi die hun werkdruk als te hoog bestempelen vertoont 66,7% ernstige burn-out symptomen.

- Vrouwen vertonen vaker ernstige symptomen van burn-out dan mannen (40%), net als beurspromovendi (43.6%) en internationale promovendi (44.5%). Promovendi in UMC's vertonen relatief minder vaak ernstige burn-outsymptomen (31,1%).

Onderzoeksomgeving

- Op een schaal van 1 tot 7 geven promovendi de academische relaties die zij leggen in hun onderzoeksomgeving een 5,31, de persoonlijke relaties een 4,83 en hun gevoel van verbondenheid een 5,22. Gemiddeld genomen beoordelen promovendi hun

onderzoeksomgeving met een 5,08 op een schaal van 1 tot 7, wat betekent dat zij redelijk tevreden zijn met hun werkomgeving.

- Promovendi aan universiteiten beoordelen hun onderzoeksomgeving lager dan promovendi in UMC's en overige typen instellingen, net als buitenpromovendi, internationale promovendi en promovendi in Rechtsgeleerdheid en Geesteswetenschappen.

Voortgang van het promotietraject

- 27,4% van de promovendi denkt hun project niet op tijd te kunnen afmaken. Nog eens 19,5% van de promovendi denkt hun project nét wel of nét niet te kunnen afmaken.

- Hoe langer het project in totaal duurt, hoe groter de kans is dat promovendi aangeven te denken dat ze hun project op tijd kunnen afronden: slechts 37,9% van de promovendi met een driejarig project denkt het project op tijd te kunnen afronden, tegenover 55% van de promovendi met een vierjarig project.

- Hoe verder promovendi in hun project zijn, hoe minder vaak ze denken dat ze hun project op tijd kunnen afronden. 71,8% van de eerstejaars promovendi denkt hun project op tijd te kunnen afronden, tegenover slechts 41,6% van de vierdejaars promovendi.

- De meest voorkomende reden om vertraging te verwachten zijn praktische tegenslagen, een té strakke planning en nevenprojecten. Verschillende promovendi geven ook aan vertraging te verwachten als gevolg van COVID-19.

- Promovendi die verwachten niet op tijd klaar te zijn, verwachten in de meeste gevallen nog zes maanden of minder (43%) of tussen de zes en twaalf maanden (43%) nodig te hebben om hun projecten af te ronden. Promovendi aan UMC's, beurspromovendi en promovendi in de Rechtsgeleerdheid geven relatief vaak aan meer dan zes maanden nodig te hebben om hun projecten af te ronden.

Stopintentie

- 41,6% van de promovendi heeft op zijn minst soms overwogen om te stoppen met hun promotietraject. 6% van de promovendi overweegt zeer vaak om te stoppen

- Vrouwen overwegen vaker te stoppen (44,4%), net als promovendi aan universiteiten (45,3%), buitenpromovendi (48,7%), internationale promovendi (46,5%) en promovendi in de Technische wetenschappen.

- 57,3% van de promovendi die wel eens hebben overwogen om te stoppen deed dat vanwege twijfels over de wetenschap. Dit betekent dat van de hele groep promovendi 24% wel eens heeft overwogen om te stoppen vanwege twijfels over de wetenschap.

- Andere veelvoorkomende redenen om te overwegen om te stoppen zijn het werk niet meer leuk vinden (56%), twijfels over de eigen bekwaamheid om het promotietraject af te maken (51,6%) en problemen met de begeleiding (39,3%)

- 30,6% van de promovendi die wel eens heeft overwogen om te stoppen deed dit vanwege mentale gezondheidsproblemen. Dit betekent dat van de hele groep promovendi 12,8% wel eens heeft overwogen om te stoppen vanwege mentale gezondheidsproblemen.

- Beurspromovendi die wel eens hebben overwogen om te stoppen deden dat relatief vaak vanwege financiële problemen (34,7%).

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Aanbevelingen

- Verwijder het taboe op mentale gezondheidsproblemen en burn-out in de wetenschap. Te vaak nog worden mentale gezondheidsproblemen en problemen als gevolg van een hoge werkdruk gebagatelliseerd door begeleiders. Een dergelijke houding draagt alleen maar bij aan het verergeren van bestaande mentale gezondheidsproblemen en werkdruk. Gezien het grote aantal promovendi dat in enige mate te maken heeft met mentale gezondheidsproblemen, moeten universiteiten, UMC's en instellingen deze problemen en hier een open gesprek over aangaan.

- Stel promovendipsychologen aan, die gespecialiseerd zijn in de omstandigheden en ervaringen van promovendi. Aangezien de positie van promovendi substantieel verschilt van de positie van studenten, is het niet voldoende om promovendi ook toegang te geven tot studentpsychologen.

- Informeer promovendi, en met name internationale promovendi, over hoe zij hulp kunnen krijgen als zij mentale gezondheidsproblemen of werk-gerelateerde stress ervaren. Deze informatie zou onderdeel moeten zijn van de introductie-informatie die promovendi krijgen bij aanvang van hun promotietraject, en daarnaast ook goed vindbaar moeten zijn binnen het netwerk van de instelling.

- Train begeleiders om constructief te begeleiden, om zo te voorkomen dat begeleiders (extra) mentale gezondheidsproblemen of werk-gerelateerde stress veroorzaken. Hierbij zouden begeleiders ook getraind kunnen worden om mentale gezondheidsproblemen of symptomen van burn-out te herkennen, zodat zij eventueel kunnen ingrijpen voordat deze problemen uit de hand lopen.

- Echter, veel promovendibegeleiders ervaren zelf ook een hoge werkdruk.[3] Als begeleiders gestrest zijn, werkt dit zeer waarschijnlijk door op hun promovendi. Daarom ligt er een taak bij universiteiten, UMC's en onderzoeksinstellingen om de werkdruk in alle lagen van de wetenschap te verlagen door alle wetenschappers voldoende onderzoekstijd te geven, realistisch in te schatten hoeveel tijd het kost om onderwijs te geven en voor te bereiden, en alle promovendibegeleiders voldoende tijd te geven om promovendi te begeleiden. Oplossingen hiervoor vereisen politieke wil en adequate financiering.

- Geef promovendi voldoende tijd om hun proefschrift te schrijven. Hoe korter het promotietraject, hoe vaker promovendi denken hun project niet op tijd af te kunnen krijgen. Het standaard promotietraject van vier jaar fulltime moet structureel worden toegepast.

- Implementeer het systeem van het nieuwe Erkennen en Waarderen[4] ook voor promovendi. Publicatiedruk is een van de belangrijkste oorzaken van hoge werkdruk onder promovendi, terwijl het aantal publicaties op zichzelf geen valide maatstaf is van de kwaliteit van de promovendus. Het verwijderen van deze publicatiedruk en een focus op kwaliteit in plaats van kwantiteit kan bijdragen aan het verminderen van de werkdruk en stress die promovendi ervaren.

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[3] Rathenau (2020). Balans van de wetenschap 2020.
https://www.rathenau.nl/nl/vitale-kennisecosystemen/balans-van-de-wetenschap-2020
[4] VSNU, NFU, KNAW, NWO & ZonMw (2019). Ruimte voor ieders talent: naar een nieuwe balans in het erkennen en waarderen van wetenschappers.
https://www.vsnu.nl/files/documenten/Domeinen/Onderzoek/Position%20paper%20Ruimte%20voor%20ieders%20talent.pdf

Introduction

This report presents the results of the PNN PhD survey on all topics that relate to the wellbeing of PhDs. The wellbeing of PhD has been the topic of many studies before, often finding that PhDs are at great risk of mental health problems.[5] However, a complete image of the wellbeing of PhDs in the Netherlands has been lacking until now. Doing a PhD is a very valuable trajectory for all PhDs, but it should not come at the cost of their wellbeing. It is therefore of the utmost importance that we get insights into the current situation of PhDs, in order to be able to design policies that prevent the deterioration of their wellbeing.

This report aims to fill this gap. In this report, we will focus on the following topics:

- Mental wellbeing
- Workload
- Burnout
- Research environment
- Progress of the PhD project
- Considering to quit

These topics were all covered in the PNN PhD survey, that was collected from March 2nd to May 10th 2020. More information about this survey can be found in the PNN Survey report on Survey information, Demographics and COVID-19.

Remarks concerning COVID-19

Before discussing the results here, we need to mention a very important caveat. Two weeks into the data collection, the Dutch government imposed a lockdown to mitigate the spread of COVID-19, forcing employees to work at home as much as possible. As a result, many universities closed their doors for non-essential research. Because of this, many PhDs could not continue working on their projects properly, were stuck at home, and many felt anxious because of the insecure and exceptional circumstances.

We added a message to the survey, asking the PhDs to filter COVID-19 out of their answers as much as possible and to focus on their situation before the lockdown started. However, we are certain that not all PhDs have been able to do so. Though COVID-19 does not affect many of the topics of the PNN PhD survey, some of the topics in this report – mental wellbeing, progress of the PhD project and considering to quit – are likely to be affected by these exceptional circumstances.

This however does not mean that these results should not be taken seriously: as the COVID-19 crisis is still ongoing, these results do depict the current wellbeing of PhDs and offer universities, UMCs, research institutes and policy makers valuable information that can help them to create policies to help PhDs in these challenging times.

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[5] CWTS (2017). Het mentaal welzijn van Leidse Promovendi. [The Mental Wellbeing of Leiden PhDs]. Levecque, K., Anseel, F., De Beuckelaer, A., Van der Heyden, J., & Gisle, L. (2017). Work organization and mental health problems in PhD students. *Research Policy*, *46*(4), 868-879.

Methodology

General variables
Gender
At the beginning of the survey, we asked the participants what their gender is. Two thirds of the respondents are female, while less than one third is male. 0.4% of the participants did not identify as male or female, 1.2% chose the option prefer not to say, and 1 respondent did not answer this question. Given the low numbers for the category other and prefer not to say, we will not display any results for these categories in further analyses.

Type of institution
The respondents were asked at what kind of institution they were doing their PhD. The respondents could choose between University, University Medical Center, non-University Medical center, Research institutes connected to Universities, Independent research institutes Universities of Applied Sciences and Other. For those who answered "Other, namely…" and provided an open answer (n=22), we analysed the answers to see whether their institution could be categorised into one of the existing categories. This was the case for 9 respondents.

Due to the small numbers in the categories other than University and UMC, we will use a 3-group classification of type of institution when discussing other survey results. In this classification, we combine the categories university and research institution affiliated to a university into one category, keep a separate category for University Medical Centers, and combine the independent research institutes, non-University Medical Centers, Universities of Applied Sciences and other into one category, labelled 'Other'.

Type of PhD arrangement
The type of PhD arrangement was measured using a complex procedure which allowed to capture the large variation in PhD arrangements that exist in the Dutch academic system. For this purpose, different classification questions were used for different types of institutions. These institution-specific typologies were subsequently combined into one overall typology of PhD arrangements. A detailed account of this procedure can be found in the PNN Survey report on Survey information, demographics and COVID-19. The PhD typology used is the overall PhD typology that distinguishes between "Employee PhDs", "Scholarship PhDs", "External PhDs" and "Other" types of PhDs.

International PhDs
To determine whether PhDs were international PhDs, without determining this based on their country of origin, we asked the PhDs the following question: "Working in the Netherlands, do you consider yourself to be an international PhD?" Those who replied "Yes" to this question, were asked to indicate their country of origin (though it was stressed that they could skip this question if they did not want to answer this question). The responses to this question showed that 87 PhDs indicated that they were from the Netherlands. These PhDs were re-classified as non-international PhDs.

Discipline
We asked all PhDs in which discipline they are doing their PhDs. We used the HOOP-classification of disciplines. A significant proportion of the PhDs chose the option 'Other, namely' (6.4%). We analysed the responses to this item, and though some disciplines were indeed hard to classify (35%), many could be easily classified in one of the eight categories. We therefore manually assigned these PhDs to the matching discipline.[6]

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[6] An overview of which types of fields have been classified manually can be requested from the authors.

PhD phase

We have asked the PhDs in which year and in which month they started with their PhD projects. For the sake of calculating the duration of the PhD trajectory so far, we assumed that the project started on the first day of that month. We calculated the duration of the project by subtracting the start date from the date on which the PhD filled in the survey. These results were subsequently categorised into year groups. Those who were in their sixth or more year were combined into one category.

Mental wellbeing

To measure the wellbeing of the PhD candidates, the 12-item version of the General Health Questionnaire (GHQ-12) is used, first composed by Goldberg in 1972[7]. This questionnaire measures the psychological distress and the risk of developing a common psychiatric disorder. The 12-item version of the GHQ consists of the following items:

Have you recently…
    a. Been able to concentrate on what you are doing?
    b. Felt you are playing a useful part in things?
    c. Felt capable of making decisions about things?
    d. Been able to enjoy your normal day-to-day activities?
    e. Been able to face up to your problems?
    f. Been feeling reasonably happy, all things considered?
    g. Lost much sleep over worry?
    h. Felt constantly under strain?
    i. Felt you could not overcome your difficulties?
    j. Been feeling unhappy or depressed?
    k. Been losing confidence in yourself?
    l. Been thinking of yourself as a worthless person?

The answer options for items a to f are:

1. More than usual
2. Same as usual
3. Less than usual
4. Much less than usual

For items g to l, the answer options are:

1. Not at all
2. No more than usual
3. Rather more than usual
4. Much more than usual

To assess whether these items indeed measure one concept, a factor analysis was conducted, using principal axis factoring with oblique rotation (direct oblimin). The Kaiser-Meyer-Olkin (KMO) test verified that the data was suitable for the analysis (*KMO*=.924). Looking at the scree plot and Eigenvalue (5.789), a 1-factor solution is most suitable according to this dataset. This indicates that the scale indeed measures one concept. A reliability analysis further revealed that the internal consistency of the entire scale is high (Cronbach's α = .90).

Following the usual procedure for these items, the scores are recoded into binary scores: a score of 1 or 2 is converted to 0 and a score of 3 or 4 is converted to 1. A score of 1 indicates the presence of a symptom. These items were then combined into a scale by summing up the scores on these recoded items. According to Goldberg (1972), the presence of at least 2 symptoms indicates psychological distress (GHQ2+). The presence of at least 4 symptoms indicates an increased risk of developing a psychiatric disorder (GHQ4+).

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[7] Goldberg, D. P. (1972). The detection of psychiatric illness by questionnaire. *Maudsley monograph*, *21*.

Workload

To assess the workload of PhDs, we use two approaches. The first approach is to calculate the differences between the formal working hours per week and the actual working hours per week, both in absolute and relative terms, to assess the extent to which PhDs work overtime. The second approach is to ask the PhDs directly how they would describe the workload or time pressure in their PhD project. The answer options for this question ranged from "Too high" to "Too low" on a five-point scale. This scale was reverse coded, making a high score on the scale indicate a high workload.

Burnout

To measure burnout, we used a translated version of the items that are used to measure burnout in the Dutch National Survey on Employment Condition (*Nationale Enquête Arbeidsomstandigheden*)[8]. These items are based on the Utrecht Burnout Scale (UBOS)[9]. This scale consists of five items:

1. I feel emotionally exhausted by my work.
2. At the end of my working day I feel (emotionally) empty.
3. I feel tired when I get up in the morning and are confronted with my work.
4. It takes a lot from me to work with people all day long.
5. I feel completely exhausted by my work.

The answer options are "Never", "A few times a year", "Monthly", "A few times a month", "Every week", "A few times a week" and "Every day". These items were combined into a scale by taking the mean score on these five items. To verify that this scale measured burnout in one dimension, a principal axis factor analysis with an oblique rotation (direct oblimin) was used. The Kaiser-Meyer-Olkin (KMO) test verified that the data was suitable for the analysis (*KMO*=.873). The analysis revealed that these five items measure one dimension (Eigenvalue: 3.488). The reliability of the scale was good (Cronbach's α = .888). A score of 3.2 on this scale indicates serious symptoms of burnout[10].

Research environment

To measure how PhDs feel in their research environment, we used scales that are used in the annual PhD Survey of Rijksuniversiteit Groningen (Bouma, 2017; van der Scheer, 2019): the academic relationship scale, the social relationship scale, and the sense of belonging scale. Together, these scales give an indication about how PhDs feel in their research environment.

However, as the PNN PhD survey was already very long, and these scales already consisted of multiple items per scale, we decided to make a selection of the items of these scales.

To measure academic relationships, we used the following items from the original 8-item scale:

1. It is easy to find colleagues to collaborate with.
2. I collaborate well with my colleagues.
3. There are people to turn to in my department when I need help.

Personal relations were measured using all four items of the original scale:

4. I know my colleagues quite well.
5. My colleagues are interested in how I am doing.
6. I regularly spend time outside work with my colleagues.

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[8] TNO & CBS (2019). Nationale Enquête Arbeidsomstandigheden: Methodologie en globale resultaten. https://www.monitorarbeid.tno.nl/dynamics/modules/SPUB0102/view.php?pub_Id=100672&att_Id=4911

[9] Schaufeli, W.B. & van Dierendonck, D. (2000). Handleiding van de Utrechtse Burnout Schaal (ubos). Lisse: Swets & Zeitlinger.

[10] Karpinska (2018). *Betaald werk en zorgtaken [Paid work and care tasks]*. In: SCP (2018). De Sociale Staat van Nederland. [*The Social State of the Netherlands.*] (p.45-59). The Hague: The Netherlands institute for Social Research.

7. I have close interpersonal relationships with my colleagues.

Sense of belonging is measured using three items of the original 5-item scale:

8. I feel at home in my department.
9. I enjoy the atmosphere in my department.
10. This department is a good place for me to work.

The answer options ranged from "strongly disagree" to "strongly agree" on a 7-point Likert scale. In this, we deviate from the original scales, that use a 5-point Likert scale.

To confirm that the scales only measure on dimension, we executed three principle axis factor analyses for the three separate scales, as well as a principal axis factor analysis for the three scales combined. We furthermore ran reliability analyses for the scales separately and as a whole as well. The results of these analyses can be found in table 1.

The analyses show that the separate scales all measure one dimension. When the scales are analysed simultaneously, the factor analysis reveals two dimensions with an Eigenvalue over 1. Interestingly, the first dimension combines the academic relations and the sense of belonging items, and the second dimension combines the personal relations items. However, the Eigenvalue of the second dimension is relatively low compared to the Eigenvalue of dimension 2, resulting in an elbow in the accompanied scree plot that indicates that one dimension would also be an acceptable solution here. Therefore, we decide to maintain the three scales as separate scales, as they were designed as such, and to also combine the three scales into one scale. We will present the results for the three scales separately, as well as for the total scale.

Table 1: Results of factor analyses and reliability analyses of social relations and belonging scales				
Scale	Analysis N	KMO	Factors (Eigenvalue)	Cronbach's α
Academic relations	1,476	0.682	1 (2,189)	0.813
Personal relations	1,522	0.767	1 (2.991)	0.883
Sense of belonging	1,531	0.740	1 (2.641)	0.932
Total	1,442	0.880	2 (5.670; 1.332)	0.912

Progress
The main variables for measuring progress will be discussed in the results section.

Considering to quit
We asked all PhDs who had not indicated that they had quit their PhD project whether they had ever considered quitting their PhD project. They were given the following possible answers:

- Yes, very often
- Yes, often
- Yes, sometimes
- No

If the PhDs responded anything other than "No", they were asked for the reasons why they ever considered to quit. They could select multiple answers from the following options:

- Did not enjoy the work anymore
- Doubts about academia
- Doubts about own ability to finish
- Financial problems

- Found another job
- High workload
- Incompatible with other work
- Lost interest in the subject
- Mental health problems
- Personal problems
- Problems concerning supervision
- Problems with execution of the project
- Other, namely…

We had intended to also present the results of this question separately for PhDs who indicated that they had quit their project, but as there were only few of them in our survey (n=3), we refrain from that analysis.

Results

Mental wellbeing

The mental wellbeing of PhDs was measured using two indicators: one indicator that asked PhDs explicitly how they would rate their general mental health, and the 12-item scale from the General Health Questionnaire (GHQ). The answer options for the self-rated general mental health item ranged from "Very poor" to "Very good" on a 5-point scale.

Figure 1.1 shows the scores of the PhDs on the General Health Questionnaire. The higher the score, the more symptoms of mental health problems. A score of 2 or higher on this scale indicates psychological distress, and a score of 4 of higher indicates an increased risk of developing a psychiatric disorder.
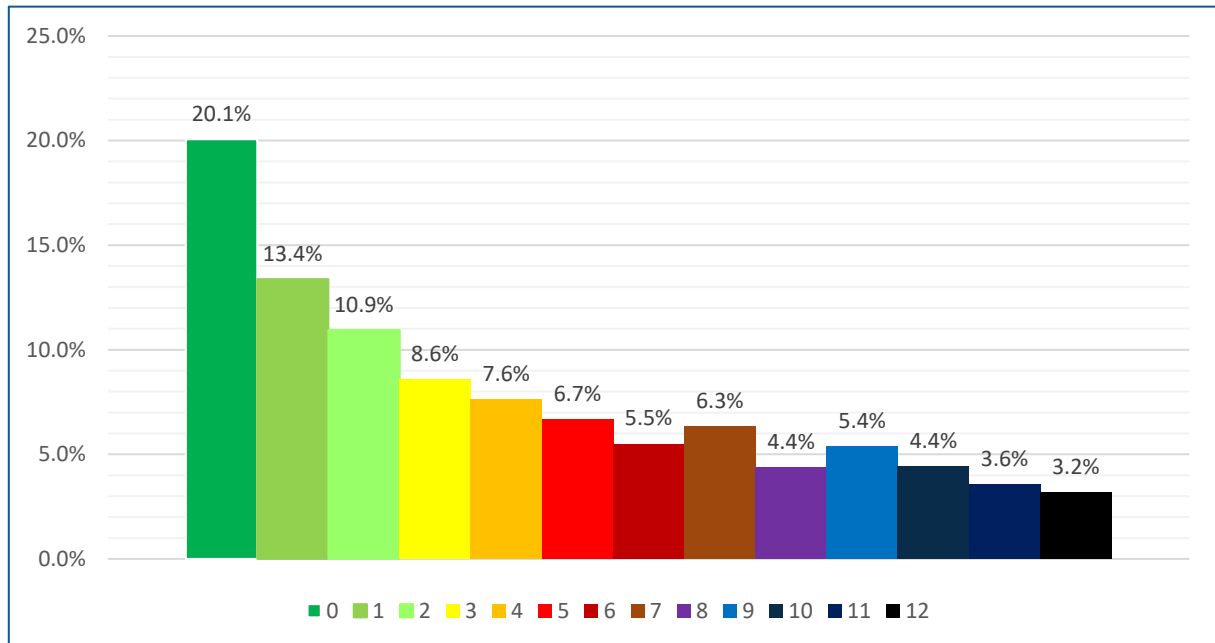

Figure 1.1: Scores on the General Health Questionnaire, 12-item version (n=1,600, mean = 4.07, standard deviation = 3.64).
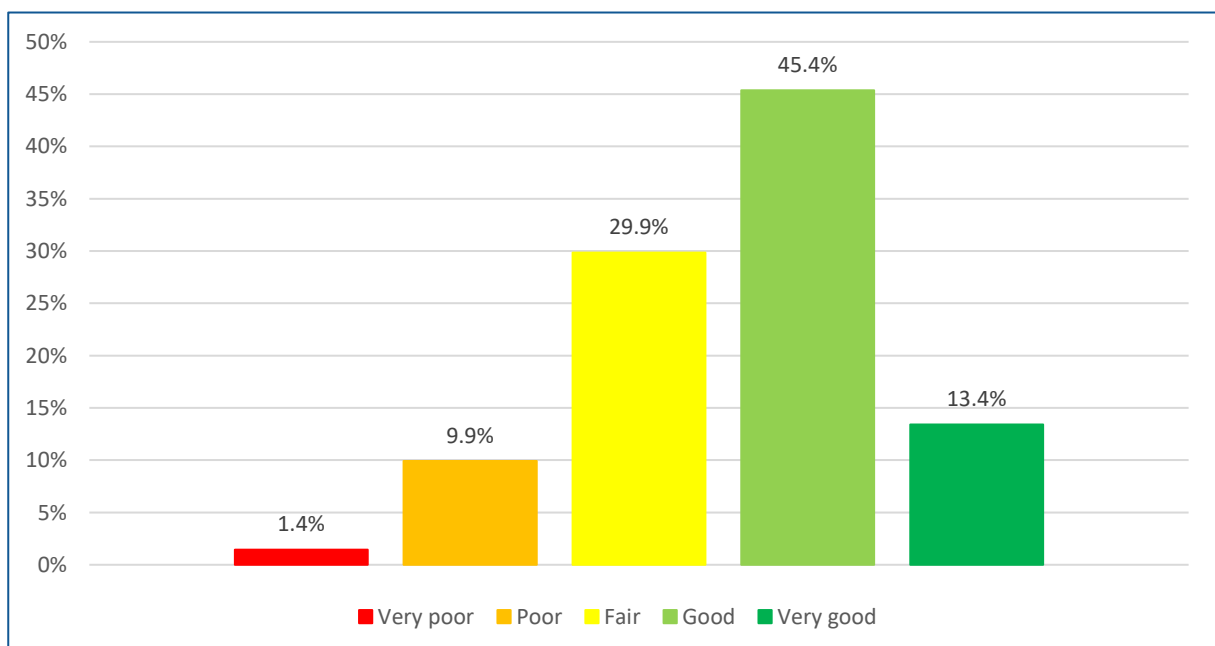

Figure 1.2: Responses to the question: "How would you rate your general mental health?" (n=1,594, mean = 3.95, standard deviation = 0.89).

20.1% of the PhDs does not indicate any of the 12 symptoms of mental health problems. This means that the large majority of PhDs, 4 out of 5, does have at least one symptom of mental health problems. 66.6% of the PhDs have 2 or more symptoms, which indicates that they experience psychological distress. 47.1% of the PhDs even score 4 or higher, which indicates that they have an increased risk of developing a psychiatric disorder. On average, PhDs have 4.07 symptoms, with a standard deviation of 3.64.

Figure 1.2 shows the scores of PhDs on the indicator that asked PhDs directly to rate their general mental health. These results give a more optimistic image of the mental health of PhDs, as 58.8% of PhDs rate their general mental health to be good or very good. 11.3% of the PhDs say that their general mental health is poor or very poor, and 29.9% classify their general mental health as fair. On average, PhDs score a 3.59 on this scale of 1 to 5, with a standard deviation of 0.89.

Relation between GHQ and self-rated mental health
The GHQ-scale and the general mental health indicator give a different image of the mental health situation of PhDs. We therefore looked into the relation between these two indicators. We plotted the mean number of GHQ-symptoms per level of the general mental health question (figure 1.3). Here, we see that PhDs who rate their mental health as very good on average still have 1.5 GHQ-symptoms, and PhDs who rate their mental health as good have 2.42 GHQ-symptoms. In these respective categories, 29.4% and 52.7% of the PhDs would be classified as experiencing psychological distress while they themselves rate their mental health as very good or good. This could either mean that PhDs have internalized that experiencing symptoms of mental health problems is normal, or that the GHQ-scale has a very low boundary of classifying people as experiencing psychological distress.
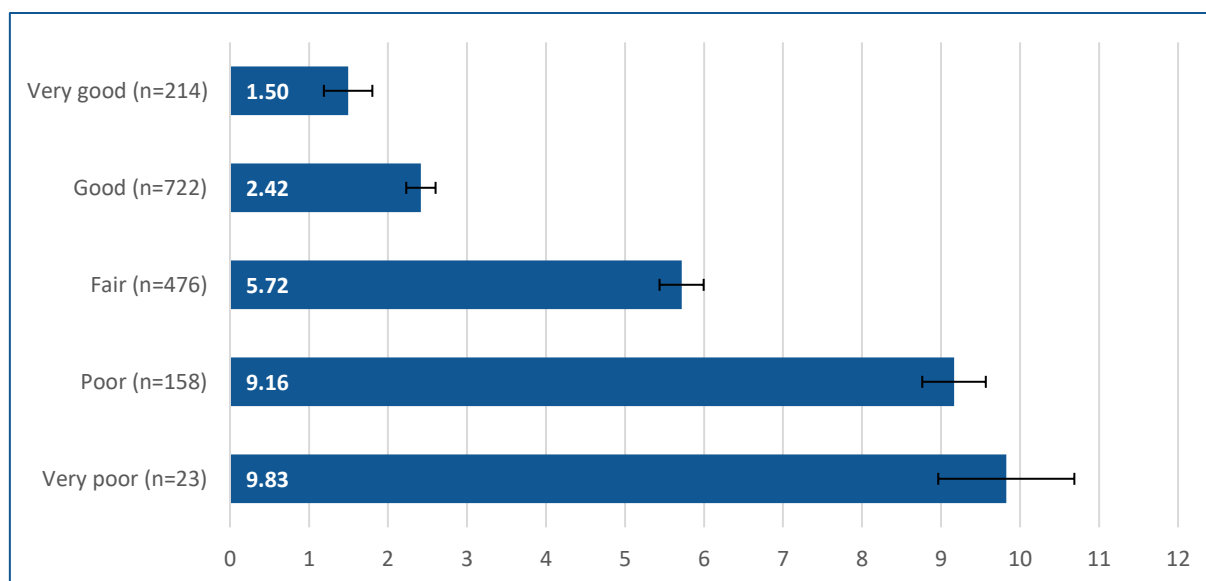
Figure 1.3: Average score on the General Health Questionnaire, per score on the self-rated general mental health indicator.

When PhDs rate their mental health as fair, the number of GHQ-symptoms goes up quite a bit, to 5.72 on average. Of these PhDs, 73.9% is at risk of developing a psychiatric disorder. PhDs who label their mental health as poor on average have 9.16 symptoms, and PhDs who rate their mental health as very poor on average have 9.83 symptoms. In these latter two categories, 96.8% and 100% of the PhDs are at risk of developing a psychiatric disorder.

Group differences in mental wellbeing

Figure 1.4 shows the scores on the GHQ-scale per gender, type of institution, type of PhD arrangement, international status and discipline, while figure 1.5 shows the scores on the general mental health indicator.

Women in general have slightly more GHQ symptoms than men (4.12 versus 3.98). This difference is not significant. Following from this, women more often report 4 or more symptoms than men (48.3% versus 43.7%). Similarly, women also rate their general mental health lower than men. However, men and women practically equally often rate their mental health as poor or very poor (10.9% versus 11%), with men relatively more often rating their mental health as very poor than women (1.9% versus 1%).

PhDs in UMCs on average score lowest on the GHQ-scale with only 3.56 symptoms on average. They have significantly fewer symptoms than PhDs at universities, who on average have 4.23 symptoms. 48.7% of the PhDs at universities score 4 or more on the GHQ-scale, indicating that they are at risk of developing a psychiatric disorder. For other types of institutions, this percentage is 47.4%, and 41.6% for PhDs at UMCs. At the same time, PhDs
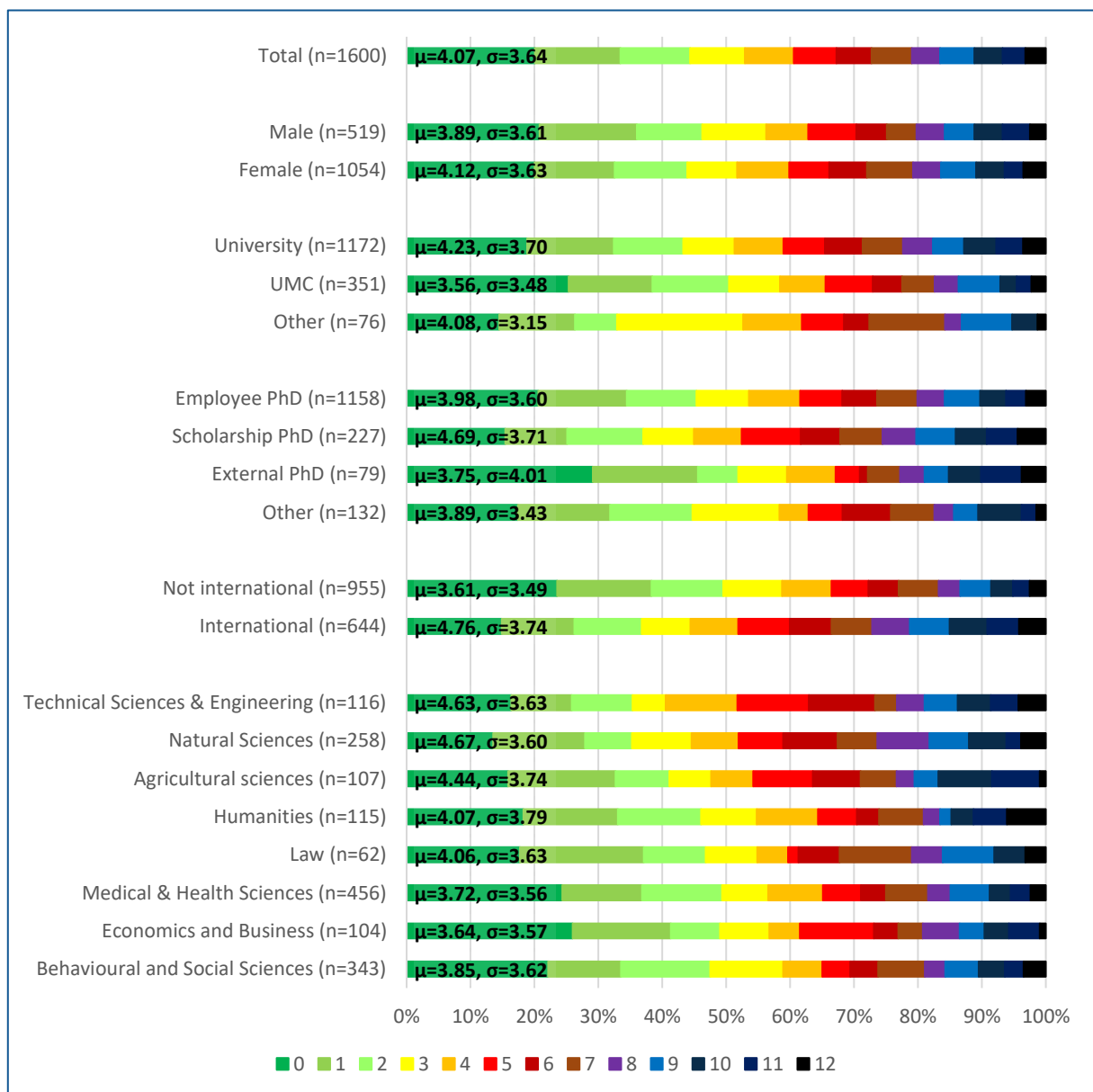

Figure 1.4: Scores on the General Health Questionnaire, per gender, type of institution, type of PhD arrangement, international status and discipline. Means and standard devations reported in the figure.

at UMCs rate their general mental health best (3.72), followed by PhDs at other types of institutions (3.63) and universities (3.55). Interestingly, PhDs at other types of institutions practically equally often rate their general mental health as poor or very poor as PhDs at UMCs (9.3% versus 9.1%). However, they more often rate their mental health as fair rather than good.

Of all types of PhD arrangements, external PhDs on average have the lowest scores on the GHQ-scale (3.75). Other types of PhDs and employee PhDs have slightly higher scores on this scale, but scholarship PhDs stand out most, with an average score 4.69. 55.1% of the scholarship PhDs have a score of four or higher, indicating that they are at risk of developing a psychiatric disorder. This is only 46.5% for employee PhDs, 41.7% for other types of PhDs and 40.5% for external PhDs. Similarly, the scores on the self-rated mental health scale are also lowest for scholarship PhDs (3.53). However, the differences between the types of PhDs are smaller on this indicator, as external PhDs score highest with only 3.68.
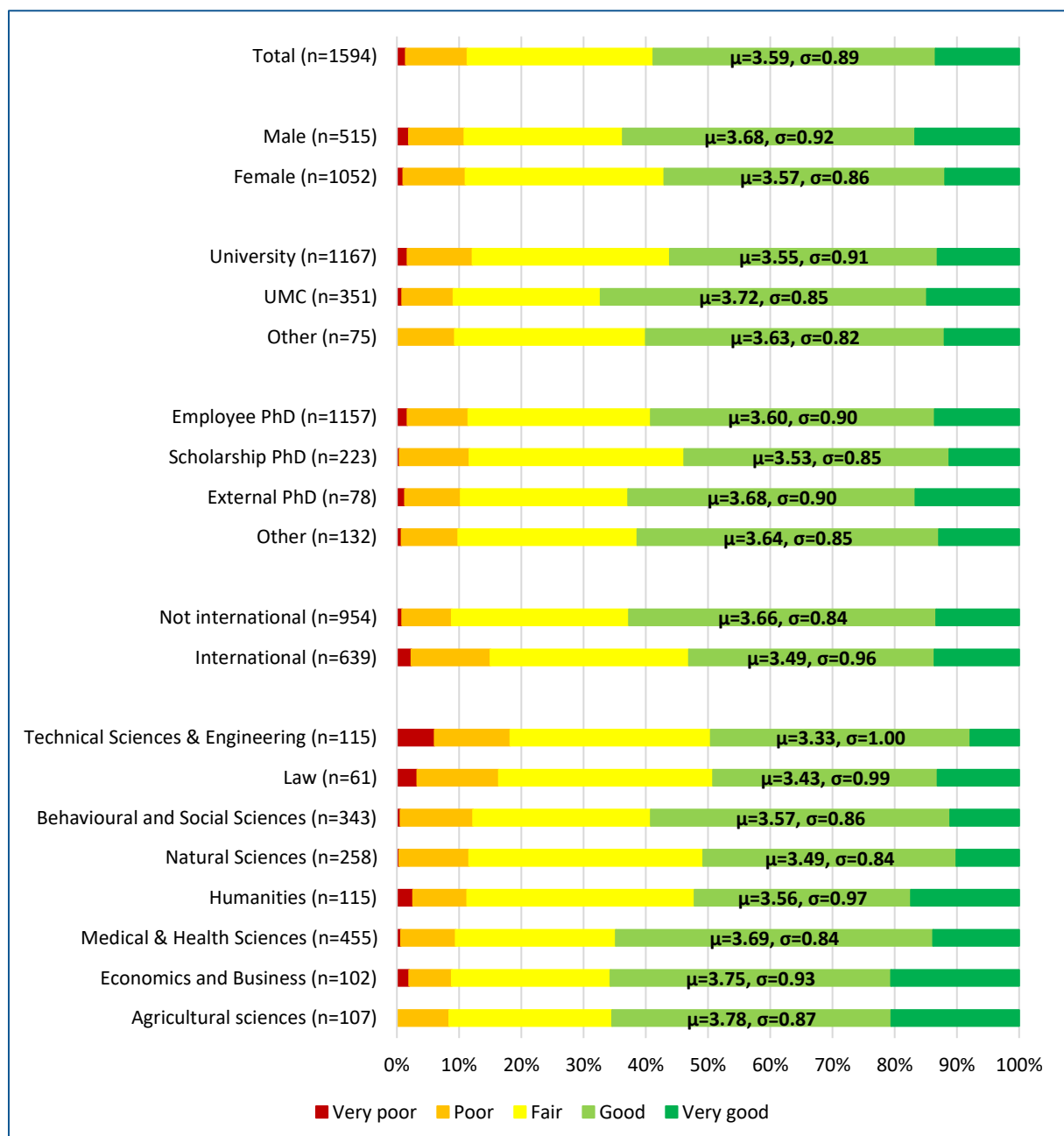

Figure 1.5: Responses to the question: "How would you rate your general mental health?", per gender, type of institution, type of PhD arrangement, international status and discipline. Means and standard deviations reported in the figure.

There are also large differences between international PhDs and non-international PhDs in both their scores on the GHQ-scale and the self-rated mental health indicator. While non-international PhDs on average score 3.61 on the GHQ-scale, international PhDs score 4.76. 55.6% of the international PhDs score 4 or more on the GHQ-scale, indicating that they are at risk of developing a psychiatric disorder. For non-international PhDs, this is only 41.3%. Furthermore, non-international PhDs also score higher on self-rated mental health (3.66), but here, the differences are again smaller, as international PhDs score 3.49. However, in both cases, the differences are significant. The fact that international PhDs have worse mental health than non-international PhDs is also likely to explain why scholarship PhDs have worse mental health than the other types of PhDs, as many scholarship PhDs are international PhDs as well.

Finally, there are also some differences between disciplines in the mental health of PhDs. In figure 1.4, the disciplines are sorted on the percentage of PhDs that score 4 or more on the GHQ-scale, while in figure 1.5, the disciplines are sorted on the percentage of PhDs that rate their mental health poor and very poor. PhDs in Technical sciences and engineering and Natural sciences score highest on the GHQ-scale (4.63 and 4.67 respectively), with respectively 59.5% and 55.4% of the PhDs in these disciplines having scores of 4 or more and thus being at risk of developing a psychiatric disorder. PhDs in Behavioural and social sciences and Economics and business score lowest on the GHQ-scale (3.85 and 3.64 respectively), with 41.1% and 43.3% of the PhDs scoring 4 or more.

The ranking of disciplines based on the proportion of PhDs rating their mental health as poor or very poor differs a bit from the ranking based on the number of PhDs scoring 4 or more on the GHQ-scale. Technical sciences and engineering again scores worst, with 18.3% of the PhDs rating their mental health as poor or very poor, but this time the runner up is Law, with 16.4% of the PhDs rating their mental health as poor. These disciplines score 3.33 and 3.43 on this indicator respectively. PhDs in Agricultural sciences and Economics and business rate their mental health best, scoring 3.78 and 3.75 respectively. In these disciplines, only 8.4% and 8.8% of the PhDs rate their mental health as poor or very poor.

Workload

Working overtime

A first indicator of the workload and time pressure experienced by PhDs is the extent to which PhDs work overtime. We asked all PhDs how many hours per week they are formally required to work on their PhD projects, and how many hours per week they actually spend working on their PhD projects. For visualisation, these responses were recoded into categories. The categorised responses to both these questions can be found in figure 2.1.
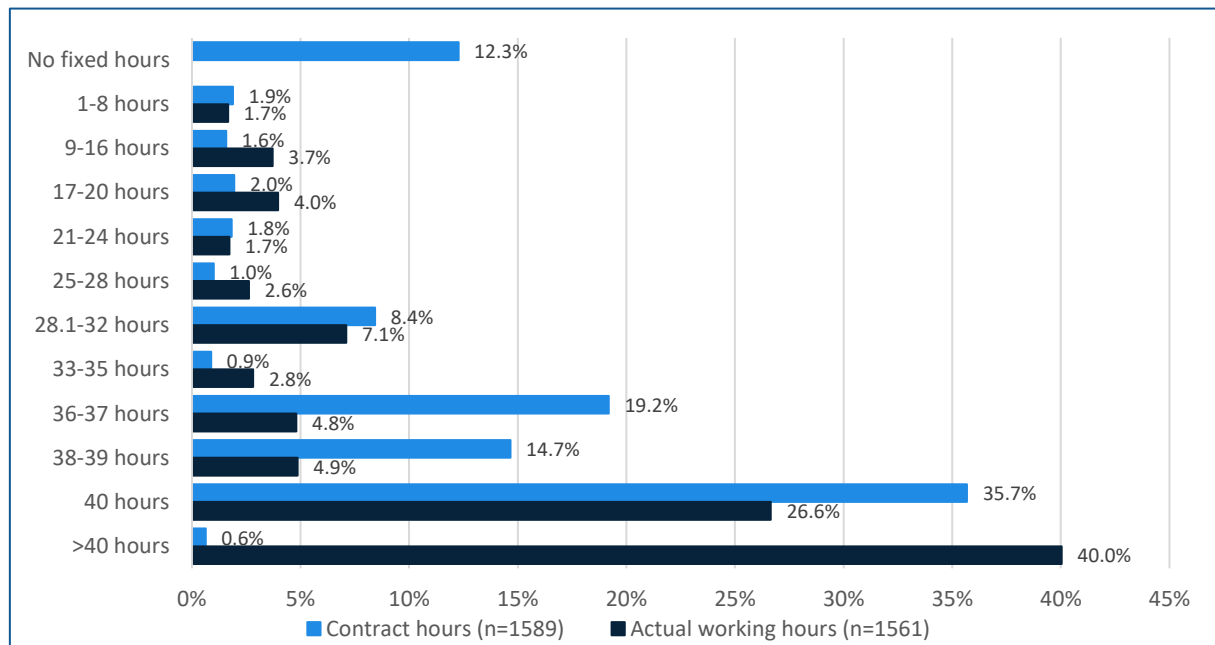

Figure 2.1: Weekly working hours according to contract (mean = 35.9, standard deviation = 6.86) and actual weekly working hours (mean = 39.4, standard deviation = 11.14).

PhDs who have a formal number of weekly working hours on average have to work 35.9 hours per week. In practice, however, PhDs, with and without formal working hours per week, on average work 39.2 hours per week. The most striking result in figure 2.1 is the high number of PhDs who indicate that they work more than 40 hours per week on their PhD project (40%), while only 0.6% of the PhDs have to work more than 40 hours per week according to their agreement.

Figure 2.1 however does not give insights in individual differences between the formal working hours and the actual working hours. Therefore, we calculated the difference between the actual working hours and the formal working hours, both in absolute and relative terms. This was of course only done for PhDs who have formal weekly working hours. On average, PhDs work 4.4 hours more than they should according to their agreement, with a standard deviation of 8.84. In relative terms, this means that PhDs work 15.9% more hours per week than they should according to their agreement.

The relative amount of overtime is visualized in figure 2.2 as well. Here we see that the largest group of PhDs work the same number of hours per week as they should according to their agreement (24.8%). 12.3% of the PhDs work less than they should according to their agreement, but 62.9% of the PhDs work more than they should according to their agreement. The largest group (21.5%) works 10-20% more, the second largest group (15.2%) works 20-30% more, followed by PhDs who work up to 10% more (9.6%). 4.9% of the PhDs work more than 50% more than they should according to their agreement.
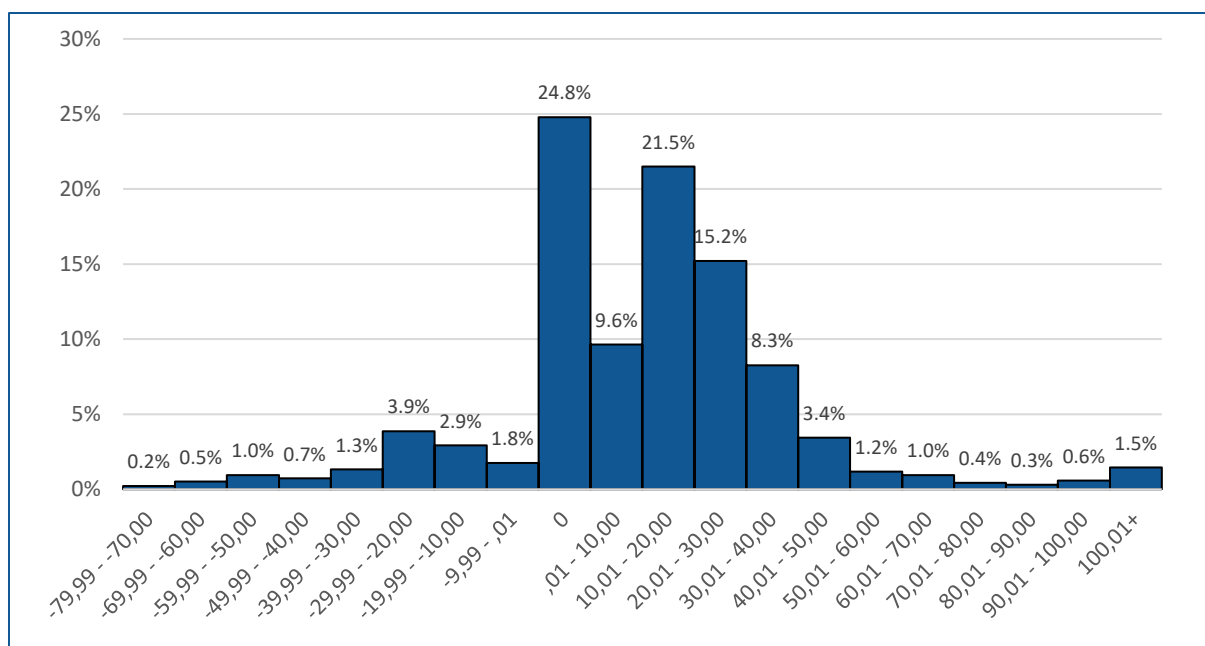
Figure 2.2: Overtime: percentage of time worked in practice relative to the time that should be worked according to the agreement (n=1,368, mean = 15.9%, standard deviation = 45.43%).

Group differences in working overtime

Furthermore, we wanted to investigate whether there are differences between groups of PhDs in their actual working hours and their relative amount of overtime. In figure 2.3, we plotted a categorised version of relative overtime per gender, type of institution, type of PhD arrangement, international status and discipline. The mean scores on the relative overtime indicator can be found in there as well. Figure 2.4 shows the average absolute overtime in hours for these categories.

Male PhDs work more overtime than women: they on average work 20.4% more than they should according to their agreement, while women work 13.8% more than they should according to their agreement. In absolute terms, this means 5.1 hours average overtime for men and 4 hours average overtime for women. The higher score of men is due to the fact that they more often than women work over 50% more than they should according to their agreement (6.2% versus 4.3%). At the same time, men also more often work less than they are required according to their agreement than women (13.4% versus 11.8%). Women stick exactly to the required number of hours slightly more often than men (25.7% versus 23%).

PhDs in UMCs work on average 21.1% more than they are required according to their agreement, which comes down to 6.4 hours of overtime. In total, 81.7% of UMC PhDs work more hours than they are required according to their agreement. At universities, PhDs on average work 13.6% more than they should according to their contracts, which is 3.7 hours in absolute terms, with 57.4% of the PhDs working more than they should. PhDs at other types of institutions on average work more than 22.7% more than they are required, but this only amounts to 4.1 hours in absolute terms. In addition, 53.6% of the PhDs work overtime. This high relative average is due to the fact that PhDs with small part-time contracts who in practice work (more than) full-time, are overrepresented in this group. PhDs at other types of institutions stick exactly to the formal working hours per week just as often as university PhDs, and relatively most often also work fewer hours than required as well. The relative average of this group therefore gives a bit of a distorted image.
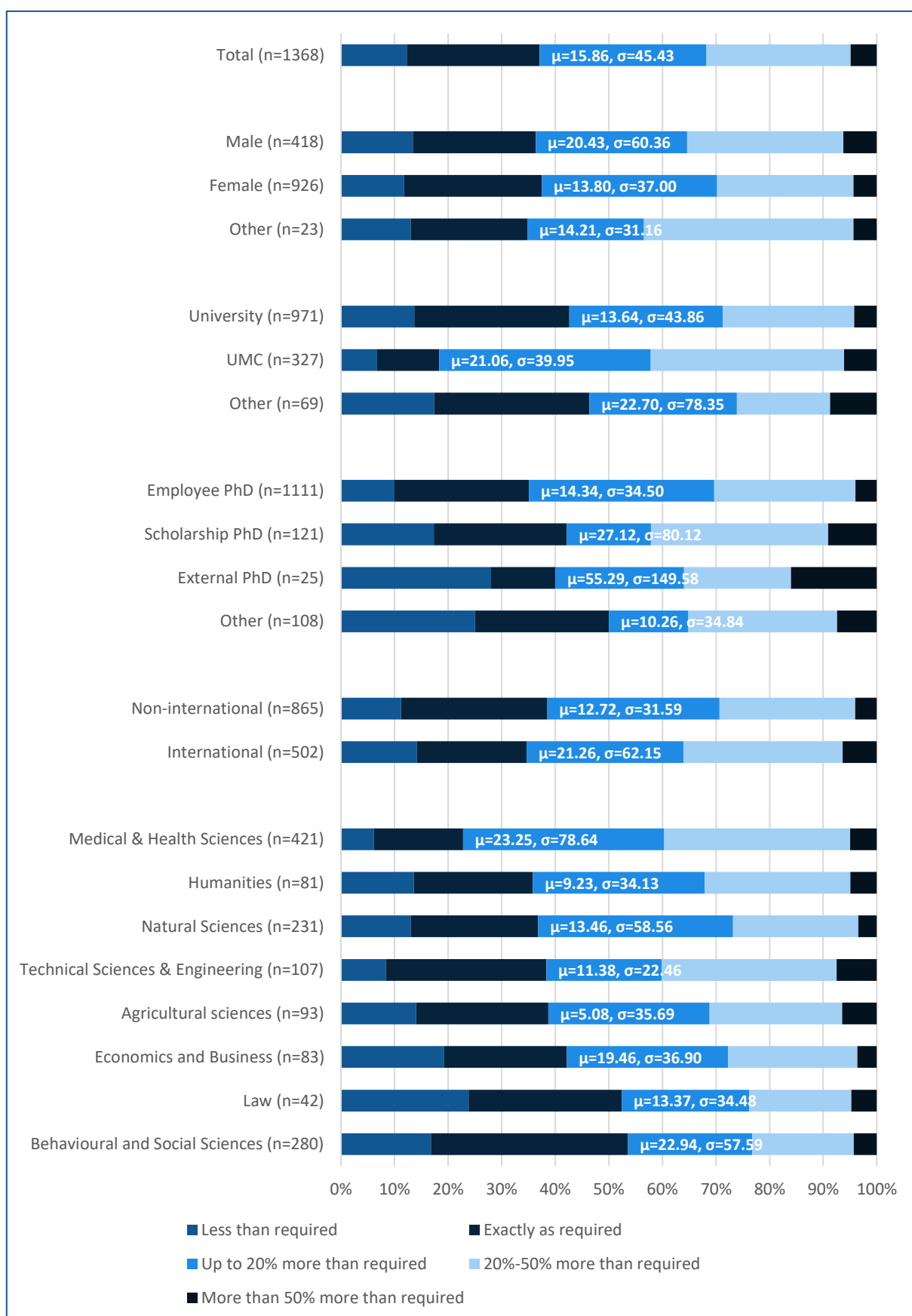
Figure 2.3: Overtime: percentage of time worked in practice relative to the time that should be worked according to the agreement, per gender, type of institution, type of PhD arrangement, international status and discipline. Means and standard deviations reported in the figure.

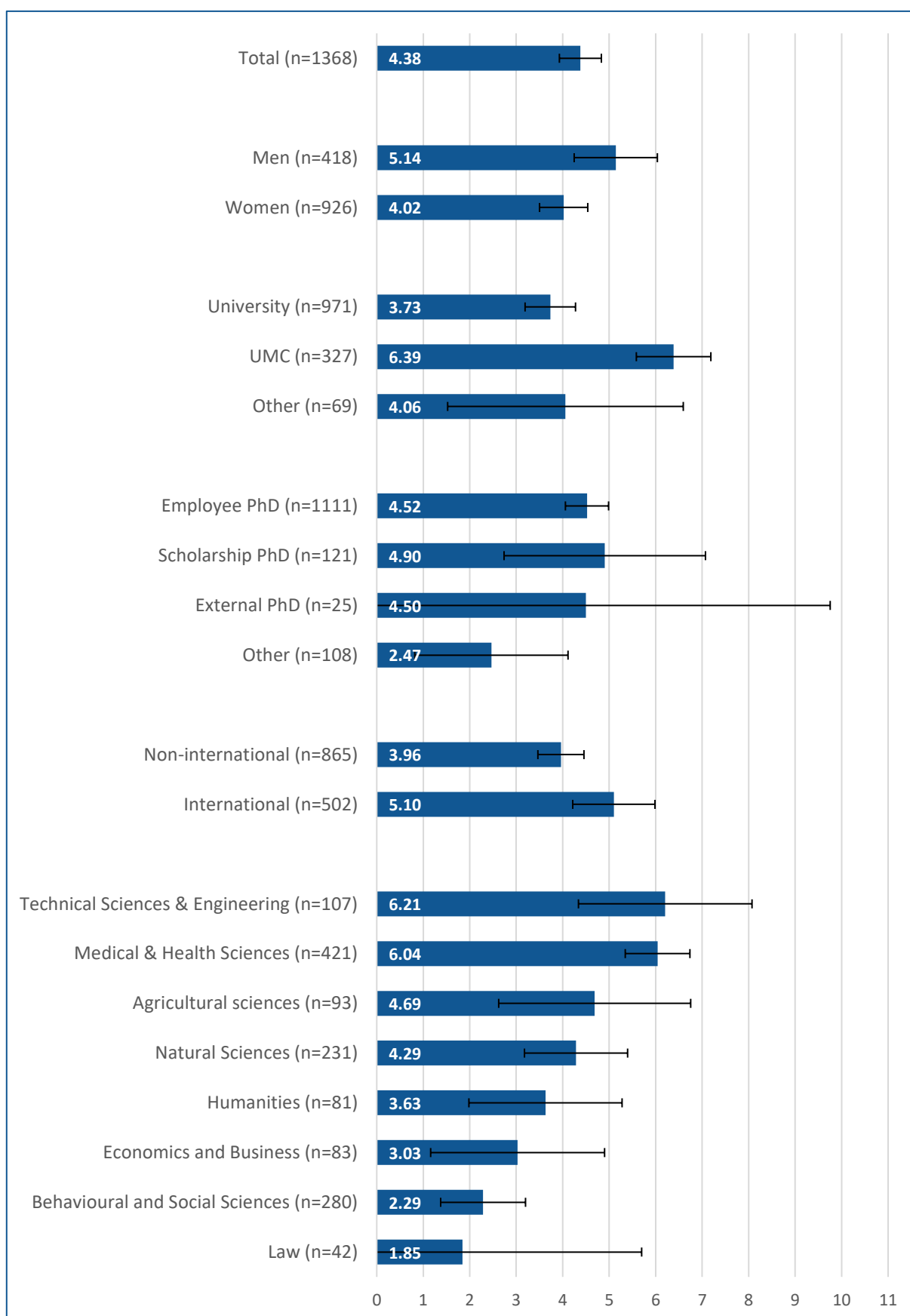*Figure 2.4: Overtime: absolute number of hours worked more in practice than should be worked according to the agreement, per gender, type of institution, type of PhD arrangement, international status and discipline.*

Looking at the differences in overtime between types of PHD arrangements, we need to keep in mind that relatively many scholarship PhDs and external PhDs do not have formal working hours per week and are therefore not included in this analysis. On average, external PhDs and scholarship PhDs have the highest relative amount of overtime (55.3% and 27.2% respectively), but looking at the number of PhDs who work overtime, this percentage is highest for employee PhDs (64.9%). The explanation for this is twofold. On the one hand it indicates that employee PhDs more often work overtime, though not a lot of overtime, and that scholarship PhDs and external PhDs less often work overtime, though if they do, they work a lot more than required. This is also shown in the plot, as 9.1% of the scholarship PhDs and 16% of the external PhDs work over 50% more than required, while this only holds for 4% of the employee PhDs. The other explanation is that scholarship PhDs and external PhDs have fewer formal working hours per week relatively more often. This is reflected by the absolute overtime, where employee PhDs and external PhDs both work 4.5 hours overtime on average. However, also in absolute terms do scholarship PhDs however work more overtime, on average 4.9 hours.

In both relative and absolute terms, international PhDs work overtime more often than non-international PhDs. International PhDs on average work 21.3% more than they are required, which amounts to 5.1 hours more in absolute terms. 65.3% of the international PhDs work more than they are required. Non-international PhDs work 12.7% more than required, which comes down to 4 hours more per week, and 61.5% of them work more than they are required. This again indicates that when international PhDs work overtime, they work relatively more additional hours than non-international PhDs. However, international PhDs also more often indicate that they work less than they are required compared to non-international PhDs.

Finally, there are also large differences in overtime between disciplines. In the plot, the disciplines are sorted based on the proportion of PhDs that indicate to work more than they are required. This proportion is highest amongst PhDs in Medical and Health sciences (77.2%). However, they do not have the highest average relative nor absolute amount of overtime. The highest average relative amount of overtime can be found in Agricultural sciences (23.3%), while the highest absolute amount of overtime can be found in Technical sciences and engineering (6.2 hours). There is no discipline that scores best or worst on these three indicators. Taking all indicators together, PhDs in Law and Behavioural and social sciences on average score lowest on these indicators, meaning they work relatively least overtime, while PhDs in Medical and Health sciences and Technical sciences and engineering on average score highest on these indicators, indicating most overtime.

Self-rated workload
Next to assessing the overtime worked by PhDs, we also asked PhDs how they would rate the workload or time pressure of their PhDs project. They could rate the workload from "Too high" to "Too low" on a 5-point scale. The responses to this question were reverse coded, making higher scores indicating a higher work load.

The responses to this question can be found in figure 2.5. 48.7% of the PhDs rate the workload of their PhD project as high, and another 10.9% rate their work load as too high, which sums up to 59.6% of the PhDs indicating a high or too high workload. In contrast, only 2.3% of the PhDs rate the workload as low, and only 2 PhDs (0.1%) indicate that they think the workload is too low. 38% of the PhDs rate their workload as normal.

Figure 2.5: Responses to the question: "How would you describe the workload or time pressure in your PhD project?" (n=1,598).

Figure 2.6 plots the responses to this question per gender, type of institution, type of PhD arrangement, international status and discipline, as well as the mean score on this indicator. Interestingly, there are no large differences between groups of PhDs in the workload they experience. Men and women practically experience the same workload, PhDs at universities experience the same workload as PhDs at UMCs and other types of institutions, there are no significant differences between types of PhD arrangements in the workload they experience, and it does not matter whether the PhD is an international PhD or not.

Even between disciplines, there are no significant differences between PhDs in the average workload they experience. PhDs in the Humanities on average most often indicate to have a high or too high workload (64.9%), while PhDs in Technical sciences and engineering least often indicate to experience a high or too high workload (53.4%). However, in Technical science and engineering, more PhDs indicate experiencing a too high workload (12.1%) compared to the Humanities (8.8%), although not resulting in any significant differences on average between the disciplines.[11]

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[11] Even when this indicator is treated as nominal in a multinomial logistic regression, the only significant difference is that PhDs in Technical sciences and engineering are less likely to report a high workload relative to a normal workload, compared to PhDs in Humanities. However, they as equally likely to report a very high workload, relative to a normal workload, as PhDs in Humanities.

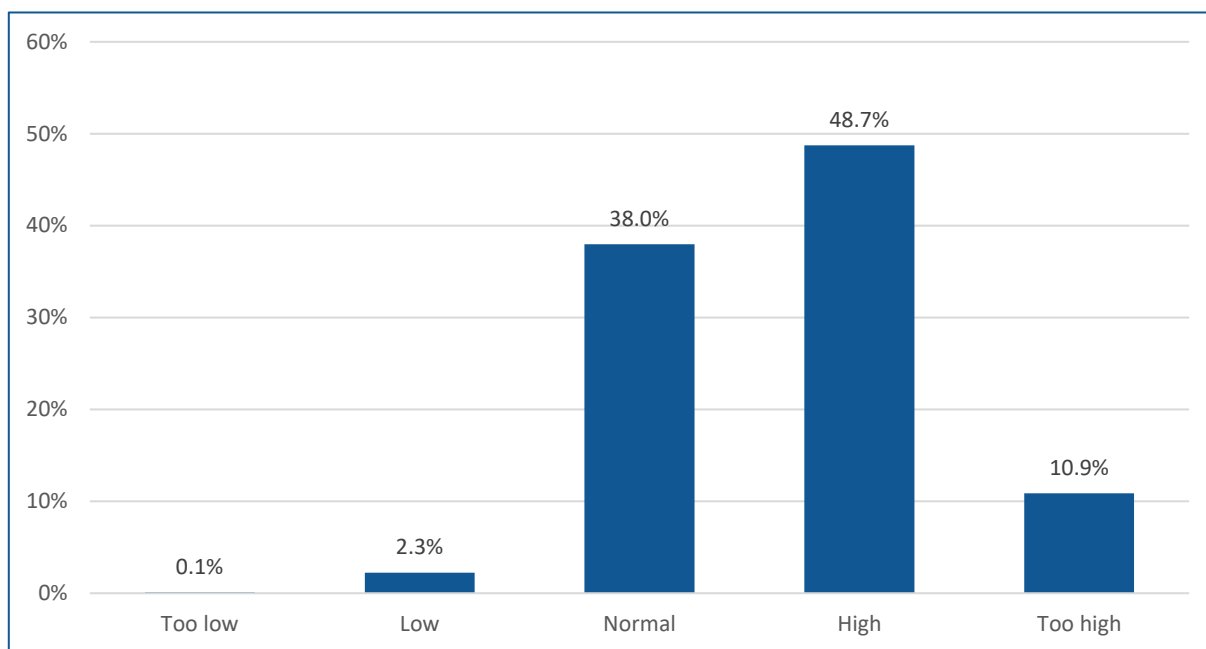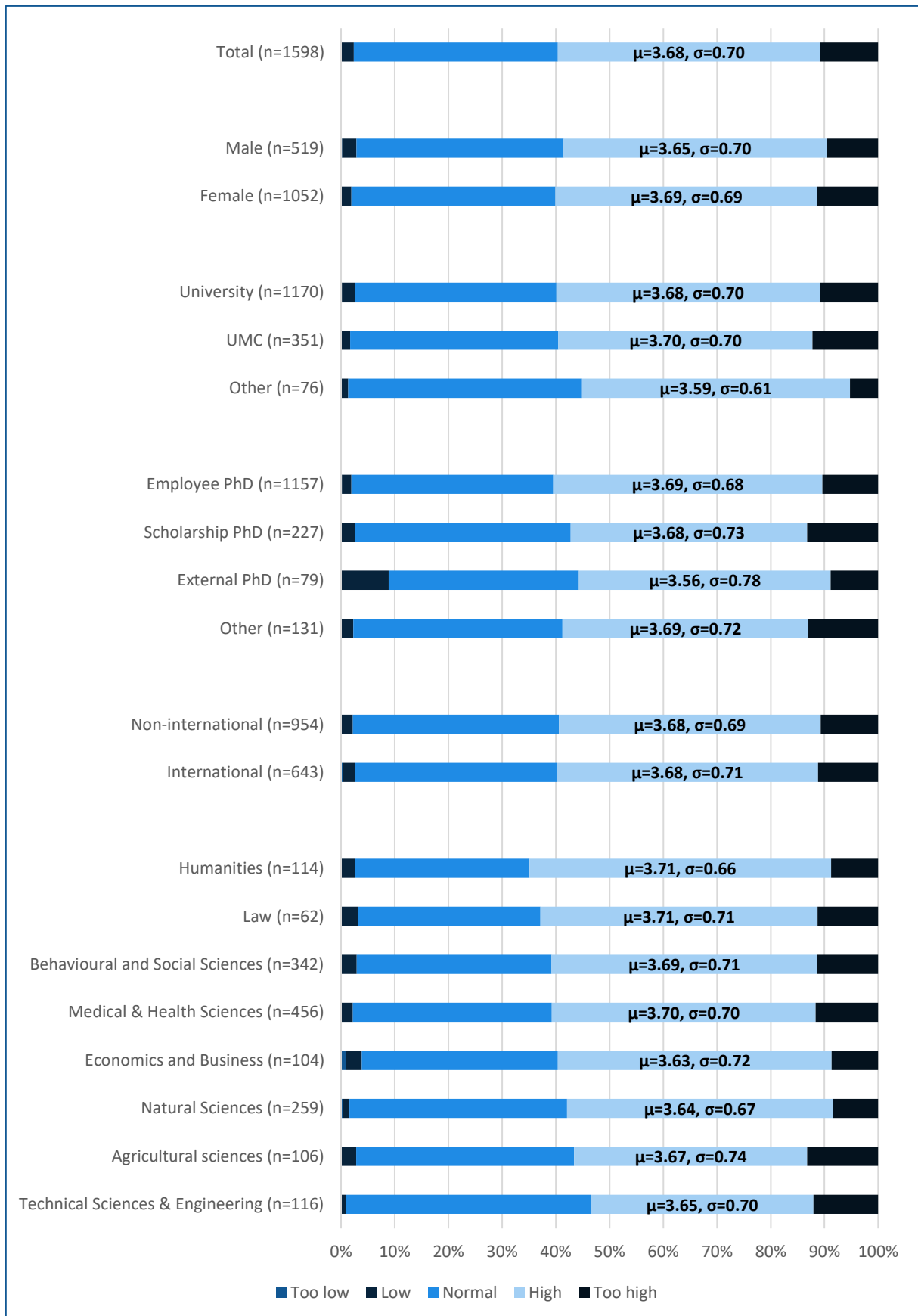*Figure 2.6: Responses to the question: "How would you describe the workload or time pressure in your PhD project?", per gender, type of institution, type of PhD arrangement, international status and discipline. Means and standard deviations reported in the figure.*

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High workload resilience

The PhDs who indicated that they experience a high or too high workload were asked to what extent they were bothered by the high workload. The responses to this question can be found in figure 2.7. 4.8% (n=46) of the PhDs are not affected by a high workload. 52.5% (n=499) of the PhDs are somewhat bothered by a high workload, 34.4% (n=327) considerably and 8.3% (n=79) are extremely bothered by a high workload.
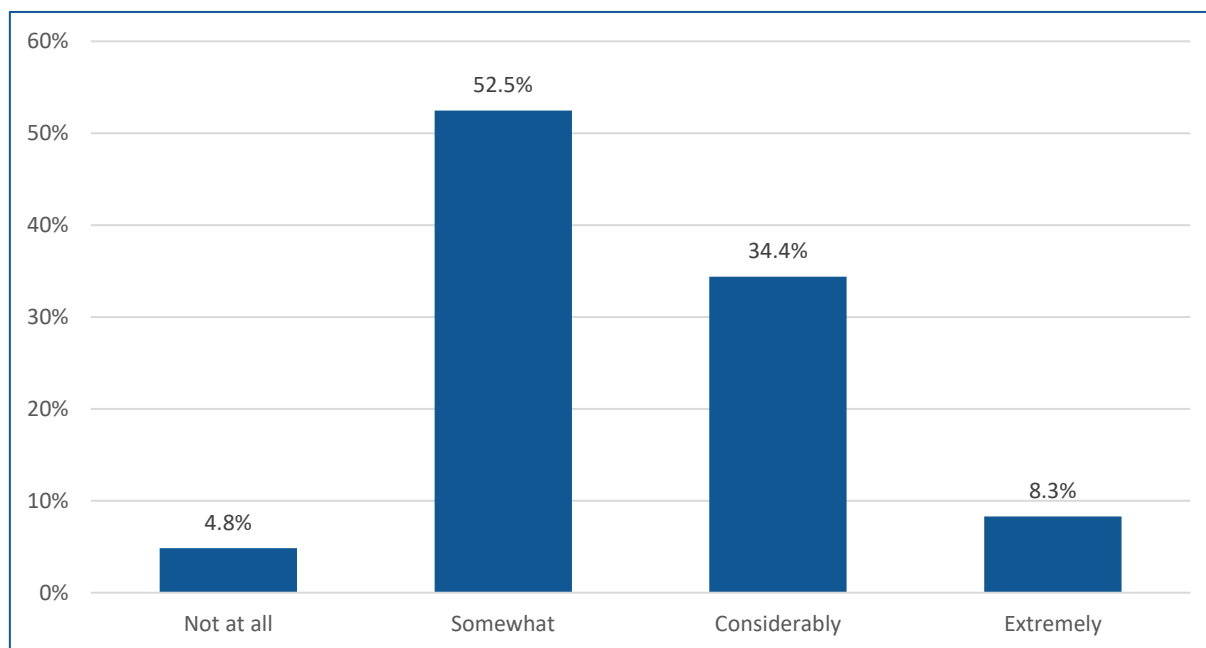
Figure 2.7: Responses to the question: "To what extent does a high workload or time pressure bother you?" (n=951).

Figure 2.8 shows the extent to which PhDs are bothered by a high workload per gender, type of institution, type of PhD arrangement, international status and discipline, as well as the mean score on this indicator. As there were practically no significant differences in the experienced workload between groups of PhDs, this shows the resilience of groups of PhDs in dealing with a high workload.

Of course, an important predictor of the extent to which PhDs are bothered by the workload is whether they have rated their workload as high or too high. PhDs who experience a very? high workload are very often considerably or extremely bothered by the workload (80.5%), while PhDs who label their workload as high are most often only somewhat bothered by the workload (59.8%). All PhDs who experience a too high workload are at least considerably bothered by the workload, as none of these PhDs indicate to be not at bothered by their workload.

Women indicate relatively more often to be extremely or considerably bothered by a high workload than men (combined 44.6% versus 38.5%). Men more often indicate to be not at all bothered by a high workload than women (5.9% versus 4.3%).

PhDs at universities relatively often indicate being extremely bothered by a high workload (9.4%), while PhDs at other types of institutions very often indicate to be considerably bothered by a high workload (52.4%), resulting in the highest proportion of PhDs being considerably or extremely bothered by a high workload. However, PhDs at other types of institutions are also relatively often not at all bothered by a high workload (9.5%). On average, PhDs at UMCs score lowest in this indicator, with only 37.3% of the PhDs being considerably or extremely bothered by a high workload.
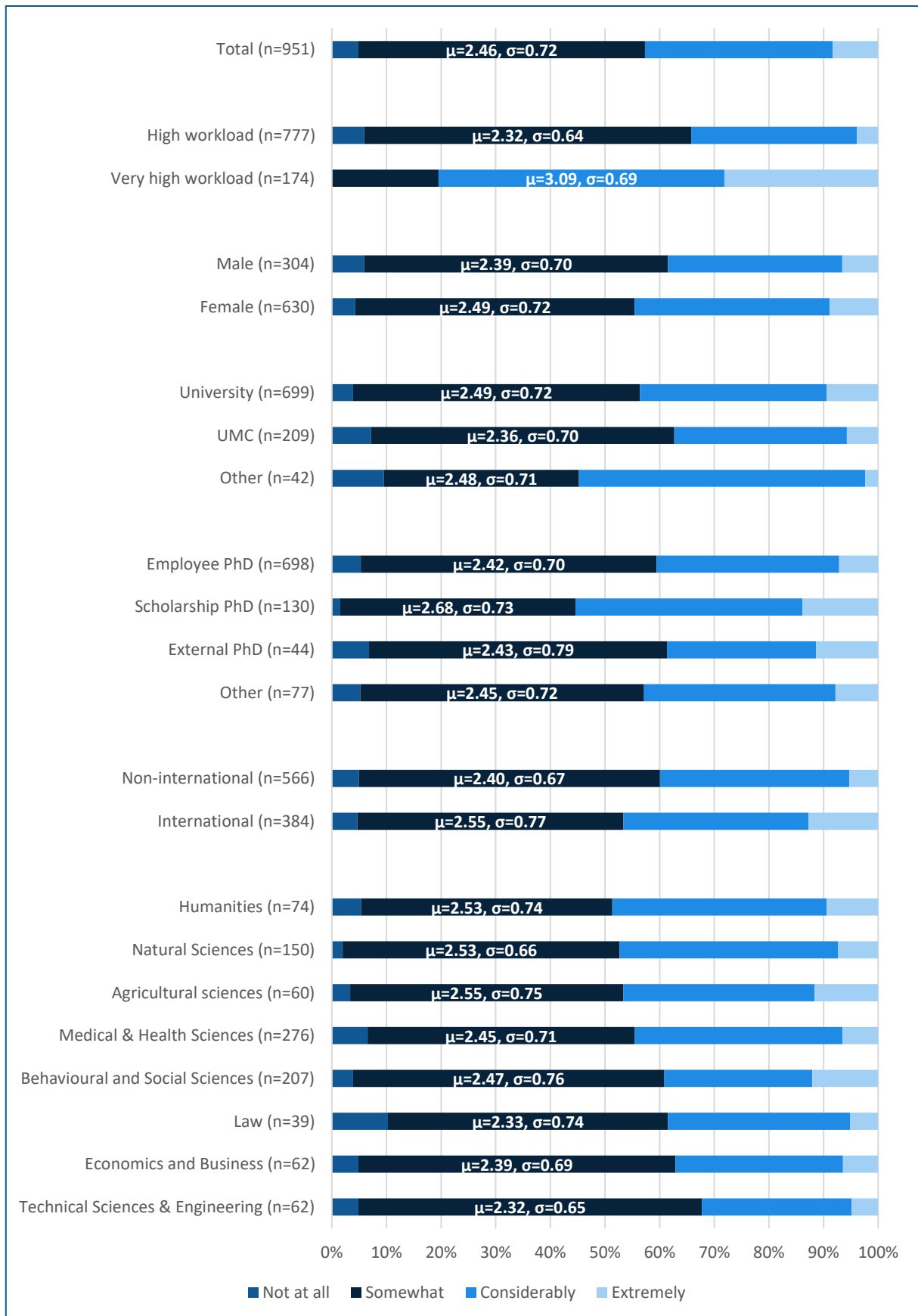
Figure 2.8: Responses to the question: "To what extent does a high workload or time pressure bother you?", per gender, type of institution, type of PhD arrangement, international status and discipline. Means and standard deviations reported in the figure.

Scholarship PhDs indicate relatively more often that they are considerably or extremely bothered by a high workload (55.4%), while only 1.5% indicate to not at all be bothered by a high workload. Employee PhDs are least often considerably or extremely bothered by a high workload (40.5%). External PhDs indicate relatively more often that they are not at all bothered by a high workload (6.8%), but also relatively often indicate that they are extremely bothered by a high workload (11.4%). They indicate relatively less often to be considerably bothered by a high workload.

On average, international PhDs are more bothered by a high workload than non-international PhDs. This is due to the fact that international PhDs indicate more often than non-international PhDs to be extremely bothered by a high workload. However, they are equally likely as non-international PhDs to be considerably bothered by a high workload, and also equally likely to indicate to be not at all bothered by a high workload.

Between disciplines, there are some differences in the extent to which PhDs are bothered by a high workload. PhDs in the Humanities relatively often indicate to be considerably or extremely bothered by a high workload (48.6%), while PhDs in Law relatively most often indicate that they are not at all bothered by a high workload (10.3%). PhDs in Technical sciences and Engineering on average score lowest on this indicator, with also only 32.3% of the PhDs indicating to be considerably or extremely bothered by a high workload, of which 4.8%-point is extremely bothered, which is the lowest proportion of all disciplines.

Reasons for a high workload
All PhDs who experienced a high or too high workload were asked to indicate who or what they thought was responsible for a high workload or time pressure. They were given 20 options in advance, which are depicted in figure 2.9. On average, PhDs selected 5.1 of these options, with a standard deviation of 2.2.
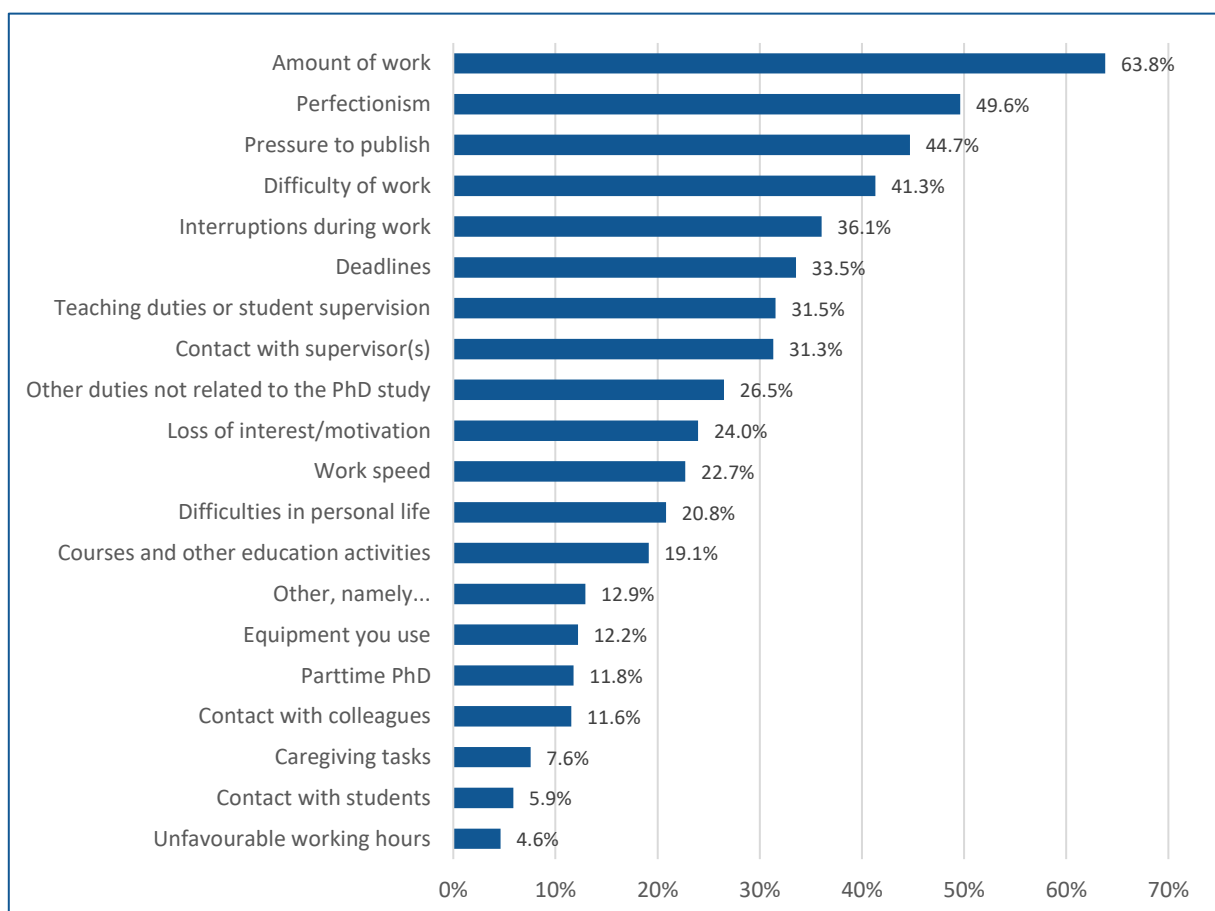

Figure 2.9: Responses to the question: "Who or what do you think is responsible for a high workload or time pressure?" (n=951).

The most selected cause of a high work pressure is the amount of work that needs to be done (63.8%). The second most common cause, perfectionism, follows at quite a distance and is indicated by 49.6% of the PhDs. Pressure to publish comes in third as a cause of high workload at 44.7%. Unfavourable working hours and contact with students are the least common causes of high workload (4.6% and 5.9%). For 31.5% of the PhDs, teaching duties contribute to a high workload. Contact with supervisors also increases the workload for 31.3% of the PhDs. 24% also indicate that a loss of motivation or interest has resulted in a higher workload or time pressure.

There are quite a lot of differences between groups of PhDs in the reasons they state for their high workload, which makes it both unfeasible to plot the results and also unfeasible to address them all. Due to the large amount of data, the results can be found in table A1 in the appendix. Here, we only briefly discuss some striking differences.

PhDs who experience a too high workload more often indicate contact with supervisors as a reason for a high workload than PhDs who experience a high workload (42% versus 29%). Women on average indicate more causes of work pressure than men (5.5 versus 5). Due to this, women score higher on many causes than men. However, men indicate relatively more often that the difficulty of the work and loss of interest or motivation are reasons for higher work pressure than women.

PhDs at universities indicate relatively less often that deadlines are the cause of high workload than PhDs at UMCs or other types of institutions. PhDs at UMCs indicate relatively less often that teaching is a cause of high workload, while PhDs at other types of institutions indicate relatively less often a loss of interest as a reason for a high workload.

Scholarship PhDs most often point out pressure to publish as a reason for a high workload, and also relatively more often state that the difficulty of the work leads to a higher workload. However, scholarship PhDs and external PhDs much less often indicate that teaching causes a high workload, with none of the external PhDs selecting this option. External PhDs and other types of PhDs very often indicate doing a part-time PhD causes a high workload or time pressure.

International PhDs relatively more often indicate that the pressure to publish and the difficulty of the work are causes of a high workload. This might also explain why scholarship PhDs also score high on these indicators, as many of them are international PhDs. PhDs in Medical and health sciences and Agricultural sciences most often indicate that the amount of work is responsible for the high workload. PhDs in Technical sciences and engineering relatively often indicate that a loss of motivation is causing a high workload or time pressure. PhDs in the Humanities relatively often see the difficulty of the work as a cause of a high workload.

Burnout

We have already seen that many PhDs indicate to experience a high or too high workload. Therefore, we investigate the extent to which PhDs might be at risk of burnout. For this purpose, we use the five burnout-indicators that are also used in the Dutch National Survey on Employment Conditions (NEA). The responses to these indicators can be found in figure 3.1.
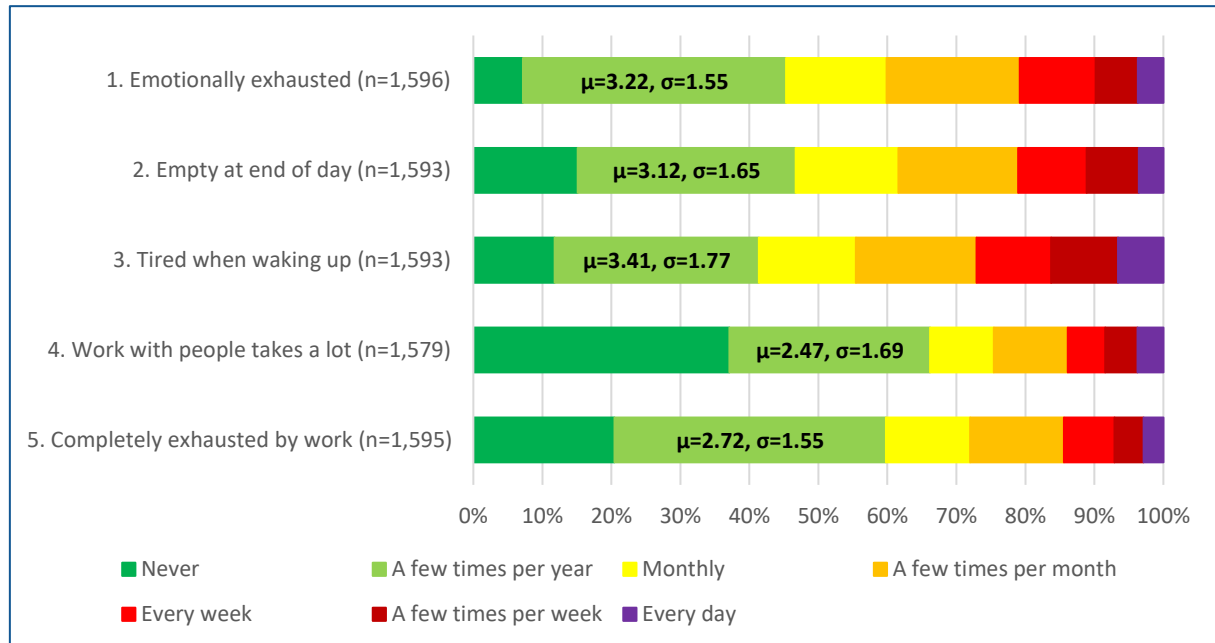
Figure 3.1: Responses to the five items of the burnout-scale.

The burnout statements that PhDs experience least often are statements 4 and 5, as 66.2% and 59.8% indicate that this applies to them never or only a few times per year. In contrast, 27.1% of the PhDs indicate that they are tired when they wake up in the morning and are confronted with their work at least on a weekly basis. 20.8% of the PhDs feel emotionally exhausted at least on a weekly basis, and 21% of the PhDs feels (emotionally) empty at the end of the working day they at least once a week.
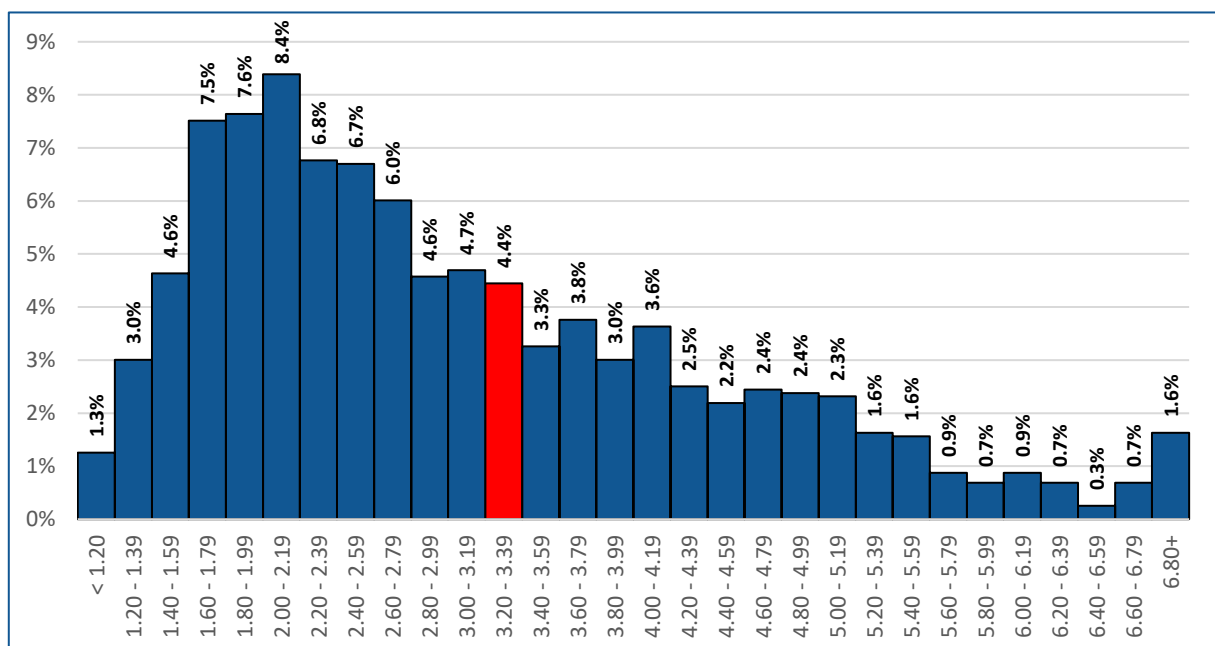
Figure 3.2: Scores on the burnout-scale (n=1,597, mean = 2.99, standard deviation = 1.37). Responses are categorised in 0.2-ranged categories for visualisation. The red bar indicates the critical boundary of 3.2, that indicates severe burnout symptoms.

Next, we combined the scores on these five indicators into one scale by taking the mean score on these items. A score of 3.2 on the burnout-scale indicates severe burnout symptoms. The scores on the burnout scale can be found in figure 3.2.

The mean score on the burnout-scale is 2.99, with a standard deviation of 1.37. This is quite close already to the critical boundary of 3.2 that indicates severe symptoms. A score of 2.99 might therefore be interpreted as moderate symptoms of burnout. The red bar in the graph shows from where PhDs score 3.2 or higher on the scale. In total, no less than 38.8% of the PhDs score 3.2 or higher in the burnout-scale. This means that 38.8% (n=620) of the PhDs shows severe symptoms of burnout.

Group differences in burnout
Figure 3.3 shows the scores on the burnout-scale per workload, gender, type of institution, type of PhD arrangement, international status and discipline. The percentage in the plot indicates the proportion of PhDs in that group that scores 3.2 or higher on the scale, indicating severe symptoms of burnout.

The experienced workload is strongly related to the scores on the burnout-scale. The higher the self-rated workload, the higher the score on the burnout-scale. PhDs who experience a high workload score on average 3.12 on the burnout-scale, which is very close to the critical border of 3.2 that indicates severe symptoms of burnout. 45% of the PhDs who experience a high workload score 3.2 or more and thus have these severe symptoms of burnout. When PhDs experience a too high workload, the score on the burnout-scale on average reaches 4.1, 0.9 point over the critical border of 3.2. 65.4% of the PhDs who experience a high workload score 3.2 or higher on the burnout-scale and thus show severe symptoms of burnout. The scores for the category "Too low" were omitted as the number of cases was very low (n=2).

Women on average score higher on the burnout-scale than men, and also more often score 3.2 or higher, indicating severe burnout symptoms. PhDs at UMCs score significantly lower on the burnout-scale than PhDs at universities and other types of institutions, and also less often show severe burnout symptoms with a score of 3.2 or higher.

Scholarship PhDs and other types of PhDs score quite a lot higher on the burnout-scale than employee PhDs and external PhD and also more often show severe symptoms of burnout with a score of 3.2 or higher (43.6% and 43.2% respectively). For scholarship PhDs, this higher score could be explained by a higher share of international PhDs. International PhDs namely score significantly higher on the burnout-scale than non-international PhDs. On average, they score a 3.23, just crossing the critical border of 3.2. 44.5% of the international PhDs show severe symptoms of burnout, significantly more compared to 35% of the non-international PhDs.

PhDs in Law score highest on the burnout-scale, crossing the critical border of 3.2 with an average score of 3.32. 44.3% of them score 3.2 or more on the burnout scale. PhDs in Economics and Business score lowest, with only 32% of them scoring 3.2 or higher and thus showing severe burnout symptoms. However, the difference between these highest scoring and lowest scoring disciplines is not significant.
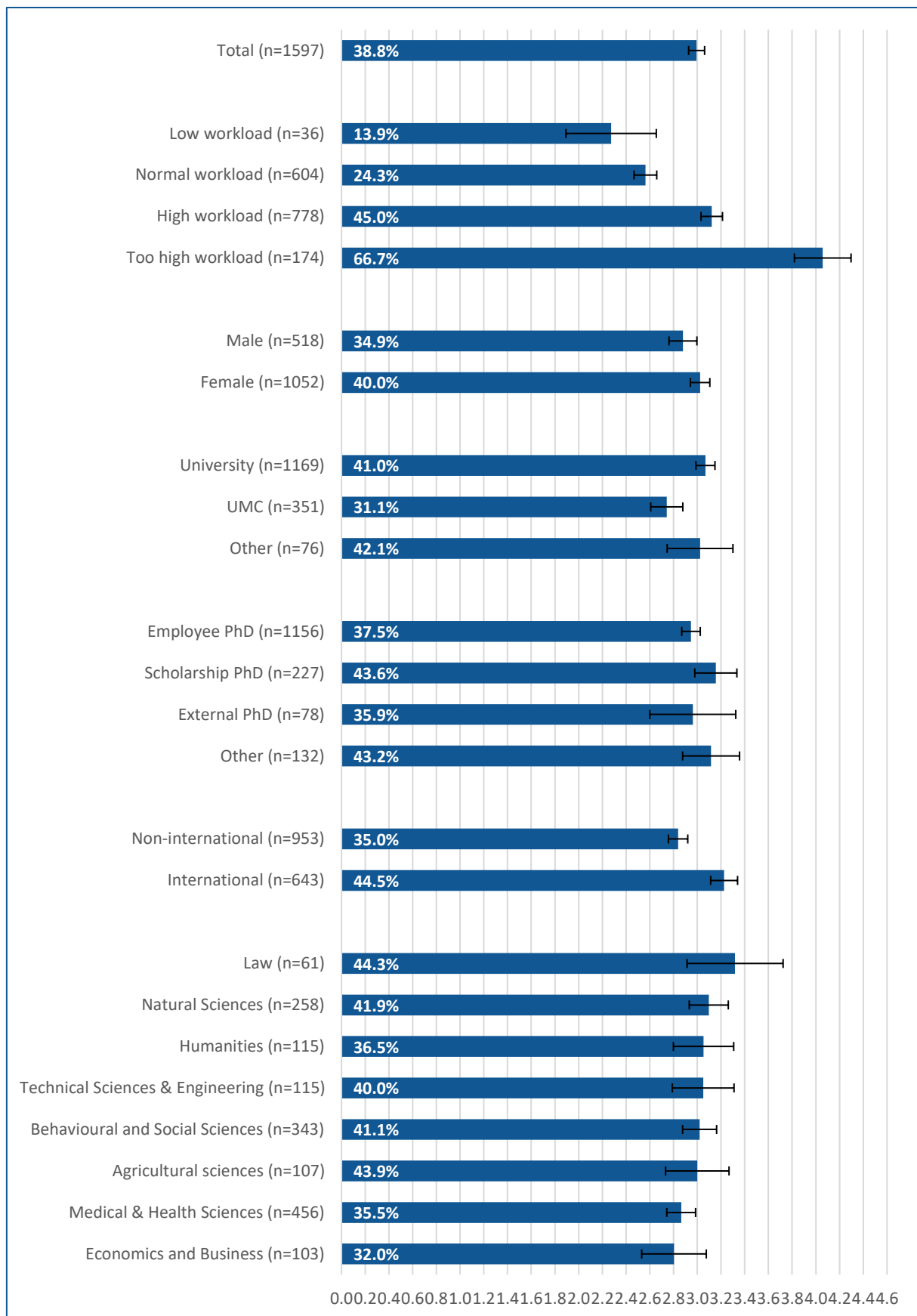
Figure 3.3: Scores on the burnout-scale, per workload, gender, type of institution, type of PhD arrangement, international status and discipline. Percentage of PhDs scoring 3.2 or higher on the burnout scale reported in the figure.

Research environment

To be able to successfully complete a PhD project, feeling good at your department is crucial. Therefore, we asked all PhDs about their academic relations, personal relations, and sense of belonging at their departments. These three separate indicators were also combined into one scale that indicates the overall satisfaction with the research environment.

The average scores on the three indicators, and the scores on the combined indicator, can be found in figure 4.1. On average, PhDs score a 5.31 out of 7 on the academic relationships-scale, a 4.83 on the personal relationships-scale, and also a 5.22 on the sense of belonging-scale. This shows that PhDs generally feel good about their research environment, but that the departments are less a source of personal relations than academic relations. On overall satisfaction with the research environment, PhDs score 5.08, indicating that they are reasonably satisfied with their research environment.
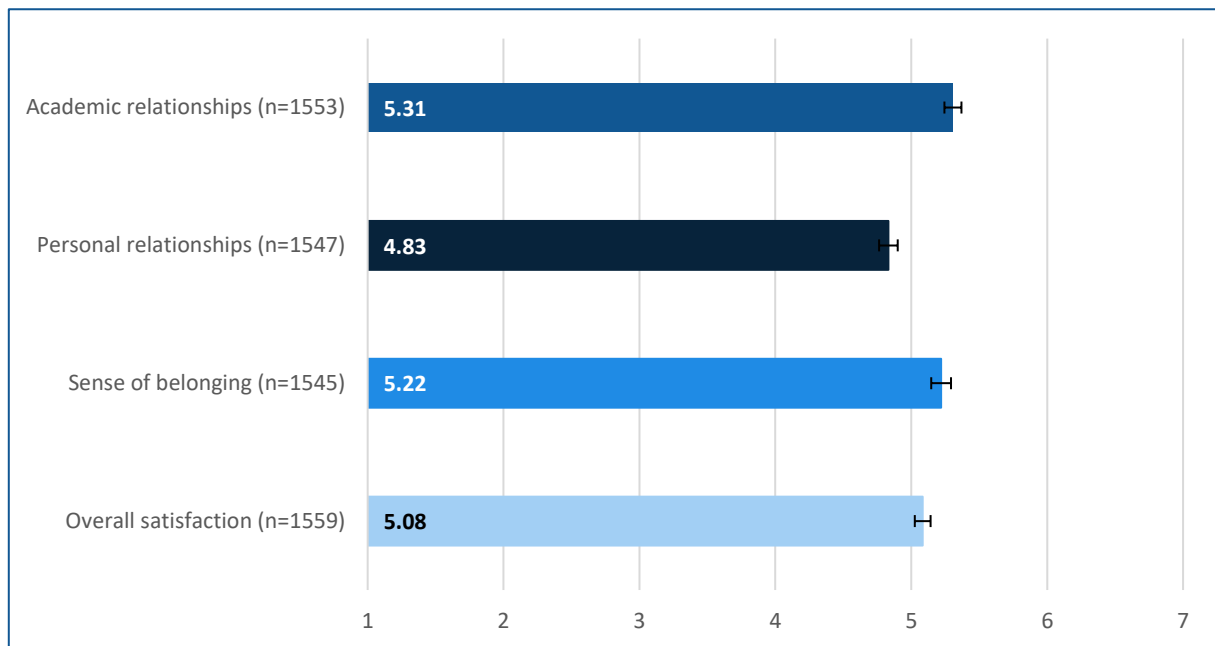
Figure 4.1: Scores on the academic relationships scale (mean= 5.31, standard deviation = 1.26), the personal relationships scale (mean = 4.83, standard deviation = 1.37), the sense of belonging scale (mean = 5.22, standard deviation = 1.46), and the overall research environment satisfaction scale (mean = 5.08, standard deviation = 1.17).

Group differences in research environment

In figure 4.2, we show the scores on the overall scale of research environment satisfaction per gender, type of institution, type of PhD arrangement, international status and discipline. We refrain from showing the results for the three separate indicators for each group, as the pattern is the same for practically all groups: the scores on the academic relationships-scale and sense of belonging-scale are higher than the score on the personal relationships-scale. The overall scale then gives more clear insights in the differences between groups.

Women score on average a little bit higher on the research environment-scale than men (5.12 versus 5.02), but this difference is not significant. PhDs at UMCs on average score significantly higher than PhDs at universities, with a score of 5.3 compared to 5.02. Scholarship PhDs and external PhDs score significantly lower on the research environment-scale than employee PhDs. However, this significant difference for scholarship PhDs is explained by the fact that international PhDs are overrepresented in that group. International PhDs score on average much lower on the research environment-scale than non-international PhDs (4.85 compared to 5.24), which is a significant difference. For external PhDs, the significant lower score remains even after controlling for international status.

There are some larger differences between disciplines in their scores on the research environment-scale. PhDs in Medical and Health sciences indicate the highest average score on this indicator (5.32), while PhDs in Law give their research environments the lowest average score (4.59). As of Technical sciences and engineering, all disciplines have significantly lower scores on the research environment scale than Medical and Health sciences. Conversely, all disciplines up from Behavioural and social sciences score significantly higher than PhDs in Law.

Figure 4.2: Scores on the overall research environment satisfaction scale, per gender, type of institution, type of PhD arrangement, international status and discipline.

Progress of PhD project indicate
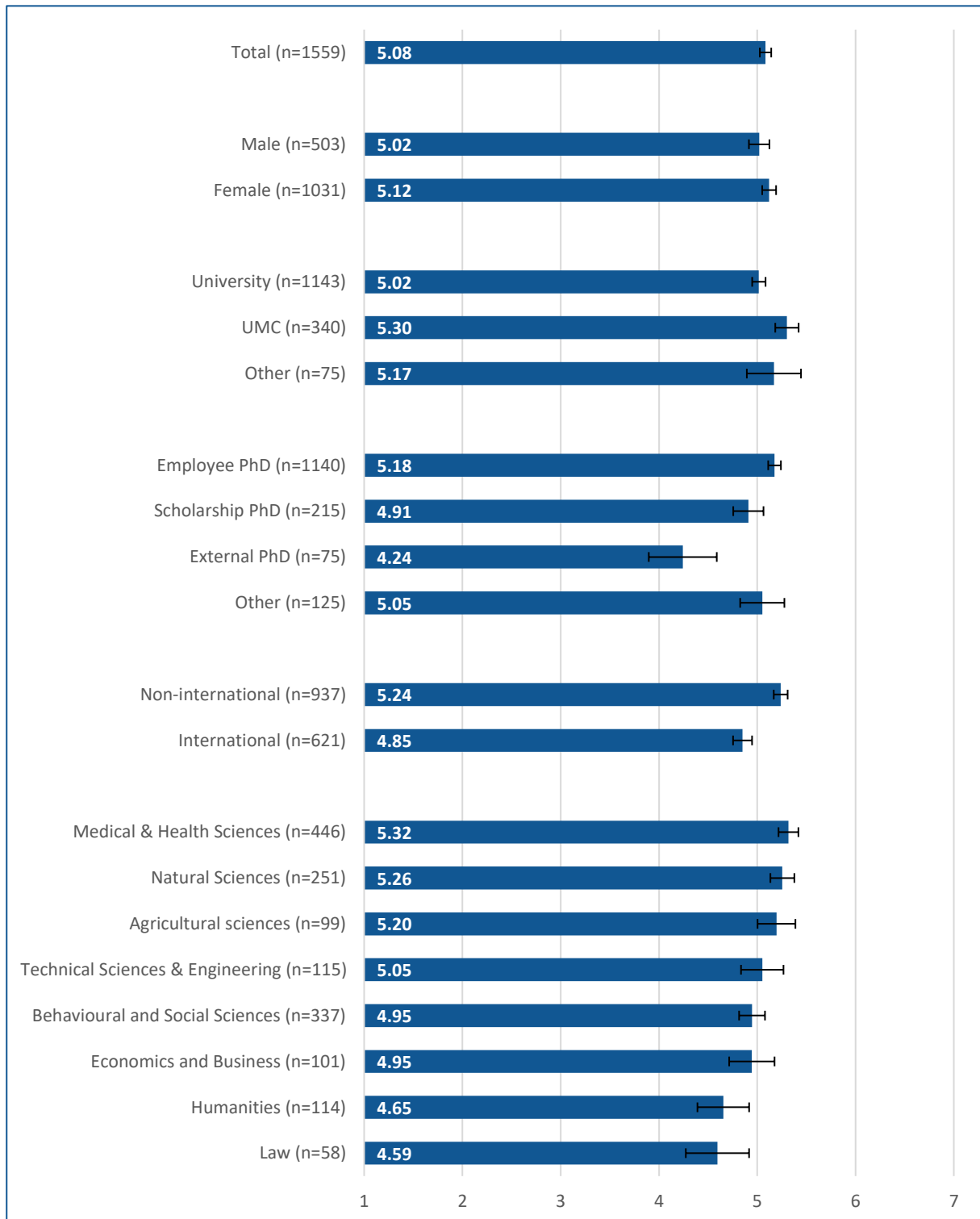
In principle, PhD trajectories have a duration of four years with a full time contract. However, many PhDs are not able to finish on time, the average duration of a PhD trajectory for employee PhDs in the Netherlands is 61 months, a full year longer than intended.[12] We therefore wanted to gain insights in the progress of the current PhD trajectories. All PhDs who were working on their PhD projects at the moment of filling in the survey, and had a fixed contract duration, were asked whether they expect to finish their PhD trajectory on time. The answer options ranged from "Definitely yes" to "Definitely not" on a 5-point scale. The responses were reverse coded so that a higher score indicates a higher likelihood of finishing on time. The responses to this question can be found in figure 5.1.
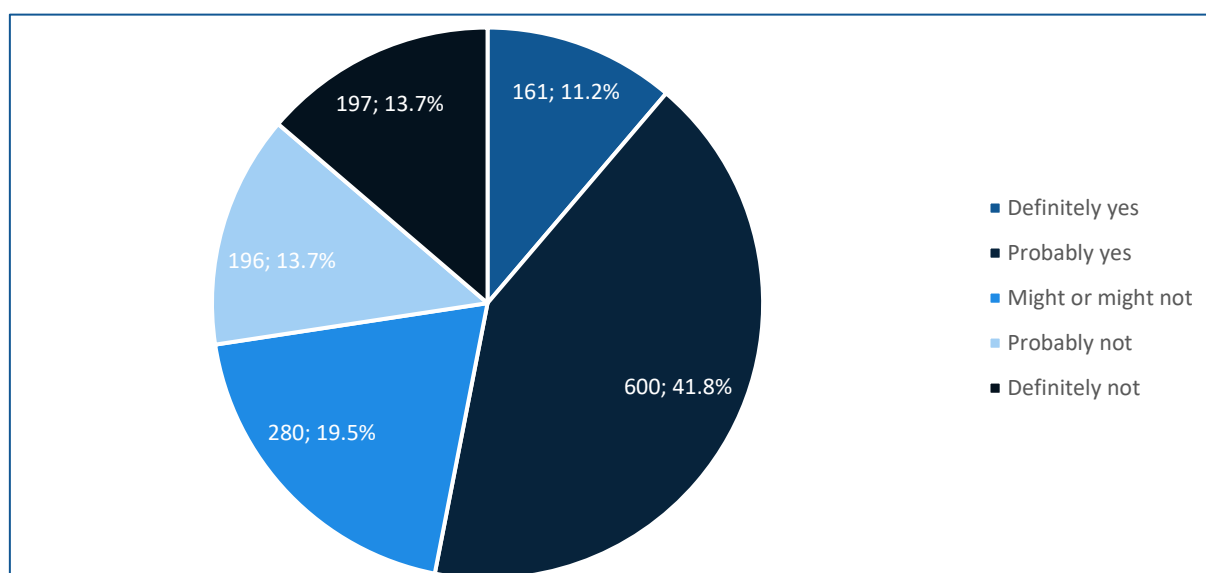
Figure 5.1: Responses to the question: "Do you expect to finish your PhD trajectory on time?" (n=1,434).

53.1% of the PhDs think they will be able to finish their projects on time, with 11.2%-point indicating that they are will definitely finish on time. On the opposite side of this scale, 27.4% of the PhDs indicate that they will not finish on time, of which 13.7%-point of the PhDs indicate that they will definitely not finish on time. 19.5% say they might or might not finish on time.

Progress and project duration

There are two main factors that may affect whether PhDs think they are able to finish on time. The first is the duration of the project. One could expect that PhDs with shorter projects are less often able to finish their PhD projects on time compared to PhDs who have longer projects. Previously in the survey, the respondents were asked to indicate the official duration of their PhD project in months. These answers were recoded into duration in years and categorised per year. We present the results for progress separately per project duration in figure 5.2, as well as the mean scores on the indicator. Before going into the substantive results, it is good to note that the "in-between" categories are relatively small, with n's not exceeding 37. The results for these group should therefore be interpreted with more caution.

In general, we see that the longer the total duration of the project, the more often PhDs indicate that they will finish on time. Of the PhDs who only have three-year projects 37.9% indicate that they will finish on time, while 43.5% indicate that they will not finish on time. Of those, 22.6%-point state that they will definitely not finish on time. Looking at the PhDs who have four-year projects, 55% of the PhDs indicate that they will finish on time, and only 25.6% indicate that they will not finish on time. For PhDs with a 5-year project, 62.2% of the PhDs indicate that they will finish on time, while 20.3% say they will not make it in those five years either.

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[12] VSNU (2018). Rapportage promovendigegevens 2018 [Report PhD data 2018]. https://www.vsnu.nl/files/documenten/Feiten_en_Cijfers/Overzichten_Promovendi_2018.xlsx

Figure 5.2: Responses to the question: "Do you expect to finish your PhD trajectory on time?", per project duration. Means and standard deviations reported in graph.

Progress and PhD phase

The second factor that may influence the extent to which PhDs think they will be able to finish on time, is the phase of the PhD they are in. At the start of the PhD project, it often feels like there is a lot of time left to finish or to adapt the project in case of delays. Nearing the end of the project, it is much more difficult to make up for delays. We therefore also present the results to this question per PhD phase in figure 5.3.

The results clearly show that the further along PhDs are in their projects, the less likely they think they are to finish on time. 71.8% of the first-year PhDs think they will finish on time, but this percentage decreases to 61.7% for second-year PhDs, 48.8% for third-year PhDs, and only 41.7% of the fourth-year PhDs think they will be able to finish on time. Similarly, the proprtion of PhDs indicating that they will not finish on time steadily increases from 9% of the first-year PhDs to 40.3% of the fourth-year PhDs, of which 20.1%-point state that they will definitely not finish on time. Figure 5.3 is a visualisation of PhDs losing faith in their ability to finish their projects on time.

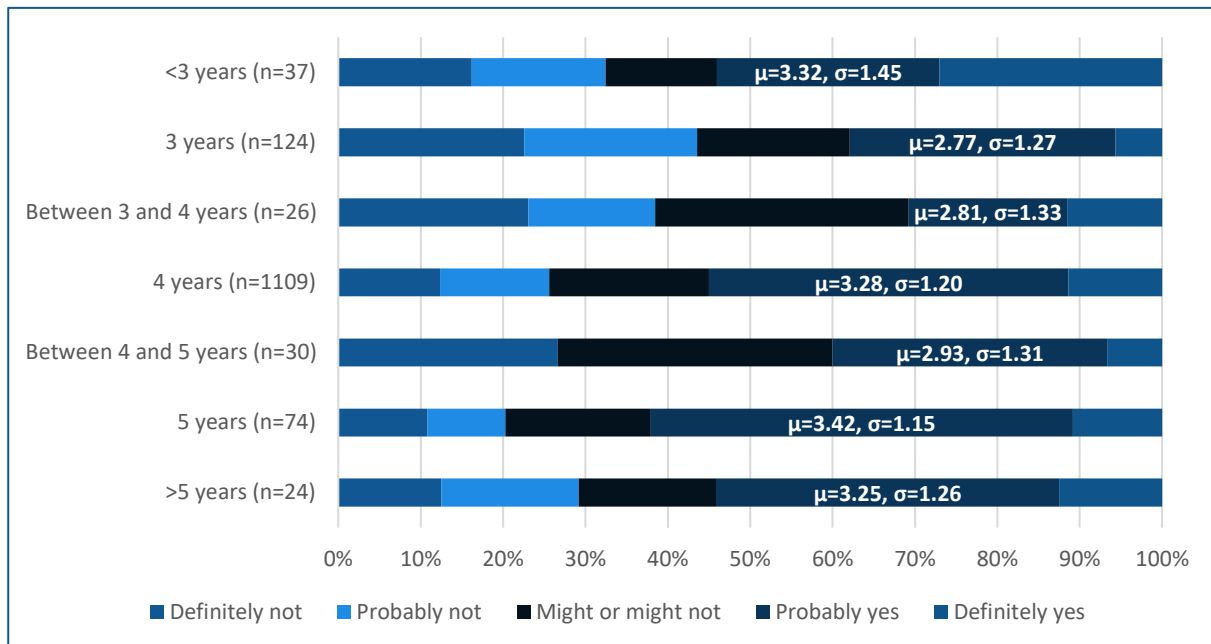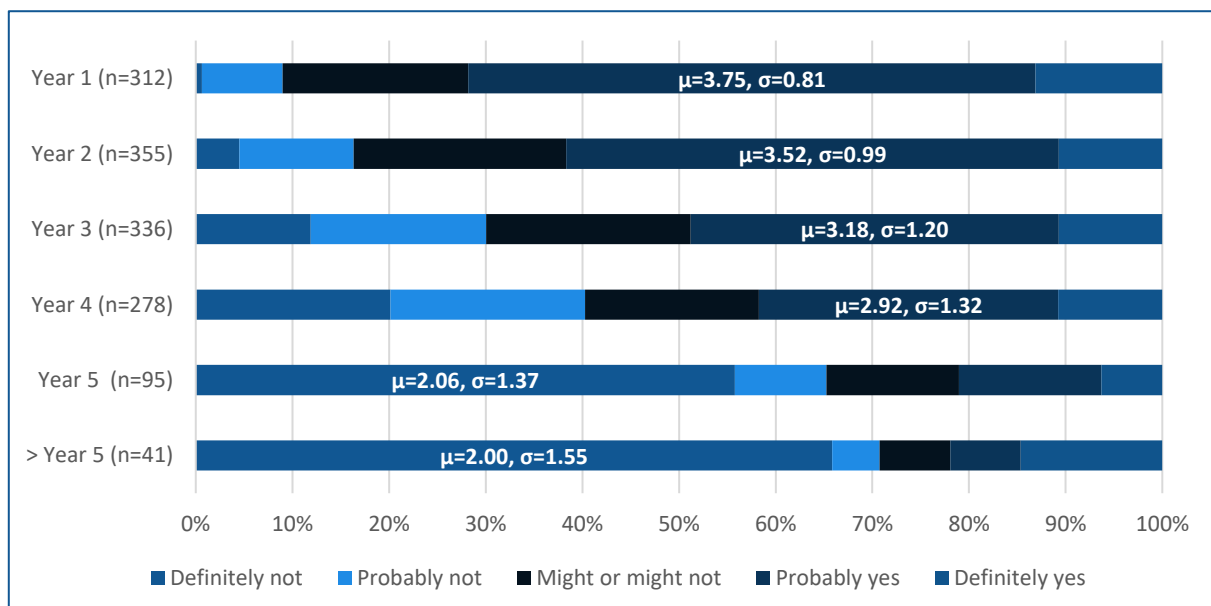*Figure 5.3: Responses to the question: "Do you expect to finish your PhD trajectory on time?", per PhD phase. Means and standard deviations reported in graph.*
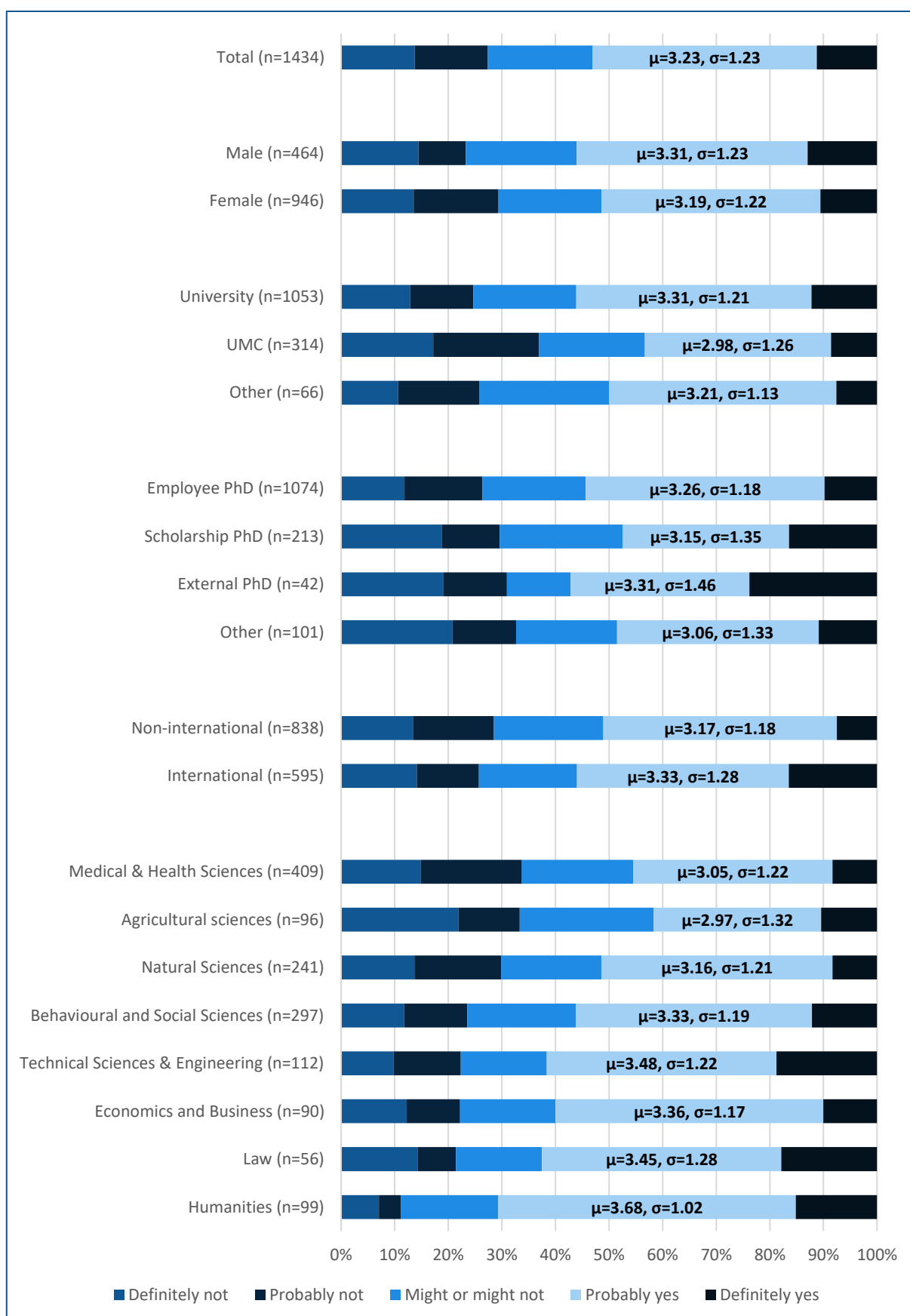
Figure 5.4: Responses to the question: "Do you expect to finish your PhD trajectory on time?", per gender, type of institution, type of PhD arrangement, international status and discipline. Means and standard deviations reported in graph.

Group differences in progress

There are also differences between other groups of PhDs (figure 5.4). Women indicate relatively more often that they do not expect to finish on time compared to men (29.4% versus 23.3%), but men indicate slightly more often that they will definitely not finish on time 14.4% versus 13.5% for women).

PhDs at UMCs also relatively often indicate that they do not expect to finish on time (36.9% compared to PhDs at universities (24.7%) or other types of institutions (25.8%). PhDs at universities are relatively most often very confident that they will definitely finish on time (12.3%). PhDs at other types of institutions are relatively less outspoken about their expected finishing time, with a relatively high share of PhDs choosing the option "might or might not" and relatively lower shares indicating that they definitely or definitely not will finish on time.

Looking at differences between types of PhD arrangements, we see something interesting. External PhDs most often indicate that they will finish on time (57.1%), but also second most often indicate that they will not finish on time (31%). Only other types of PhDs state a slight bit more often that they do not think they will finish on time (32.7%). The group of external PhDs is thus quite divided. Employee PhDs least often indicate that they will not finish on time (26.4%) and second most often indicate that they will finish on time (54.4%) instead. Scholarship PhDs relatively most often select the option 'might or might not', and least often indicate that they expect to finish on time.

Finally, there are differences between disciplines in the extent to which PhDs think they will be able to finish on time. In Agricultural sciences, only 41.7% of the PhDs think they will finish on time. PhDs in the Humanities most often indicate that they think they will finish in time (70.7%), followed by PhDs in Law (62.5%). These disciplines also have the lowest proportions of PhDs who think they will not finish in time (11.1% and 21.4%). PhDs in Medical and health sciences relatively most often indicate that they will not finish in time (33.7%), followed by Agricultural sciences (33.3%).

Reasons for delay

The PhDs who indicated that they did not expect to finish on time or that they might or might not finish on time, were asked what were the main causes due to which they might or will not finish in time. They could select multiple from the options presented in figure 5.5.
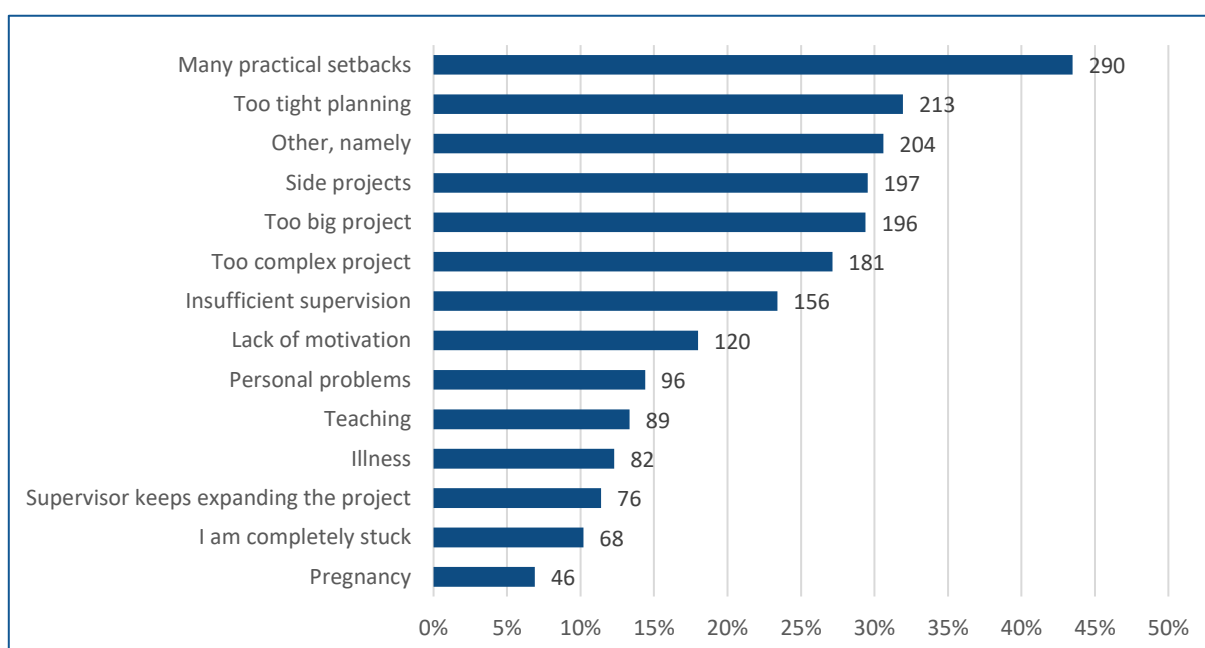
Figure 5.5: Responses to the question: "What are the main causes due to which you expect that you might or will not finish on time?" for PhDs who were still in their formal arrangement (n=667).

The most common cause of delay is the experience of many practical setbacks, which is mentioned by 43.5% of the PhDs. At quite a distance comes too tight a planning as a cause of delays (31.9%), followed by the option "Other, namely…". Of the PhDs who had selected the option "Other, namely", 24.5% mentioned COVID-19 as a reason for delay. As we had asked PhDs to try to filter COVID-19 out of their responses, this is likely to be an underestimation of the proportion of PhDs that experience delays as a consequence of COVID-19. It also shows that our message has not been fully effective.

Side projects are also relatively often the cause of delays, as are too big or too complex projects. 23.4% of the PhDs however also indicate that they are experiencing delays as a consequence of insufficient supervision. A lack of motivation and personal problems also play significant parts in causing delays. 13.3% of the PhDs indicate to experience a delay due to teaching, and 12.3% indicate that an illness has caused delays in the project. In 11.4% of the cases, a supervisor that keeps expanding the project is responsible for the delays, and 10.2% of the PhDs indicate that they are completely stuck.

Reasons for delay for PhDs whose formal agreement has ended
We also asked this question to the PhDs in our survey who indicated that their formal PhD arrangement had ended, but that they were still finishing their PhD project in their own time. Their project had thus suffered from a delay. Their responses to this question can be found in figure 5.6. Also for this group of PhDs, many practical setbacks is the most common reason for them to be still working on their PhD project in their own time (48%). However, compared to PhDs who are still within their PhD agreement, these PhDs relatively more often indicate that they are finishing in their own time due to insufficient supervision (38%) or too big projects (36%). They also relatively often mention teaching and pregnancy as reasons for delays, and relatively less often indicate too tight a planning as the cause of their delays.
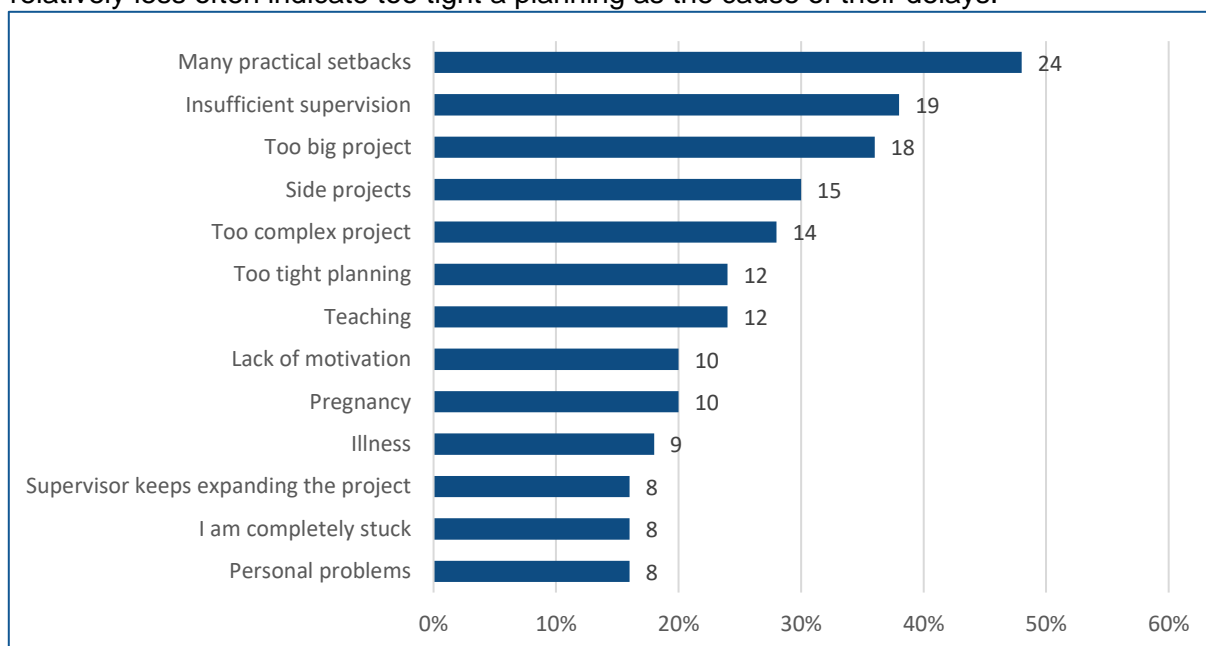
Figure 5.6: Responses to the question: "What caused the delays in your project?" for PhDs who are finishing their project in their own time (n=50).

Group differences in reasons for delay
For the PhDs who are still in their formal PhD trajectory, we also look into group differences in the reasons why they expect to experience a delay. However, plotting all these group differences on all indicators in a proper graph and discussing them in detail is not feasible. We therefore placed the full results in table A2 in the appendix, and briefly discuss some main findings here.

The reasons for experiencing delays are quite similar for men and women. Women indicate relatively more often than men that the project being too big is a reason for delay (31.2% versus 24.4%), while men relatively more often state that side projects are likely to cause delays (33.3% versus 27.9%). Men also relatively more often report a lack of motivation compared to women (21.4% versus 16.2%), while women relatively much more often indicate illness as a cause of delay (15.1% versus 5%). 15.1% of the women also mention pregnancy as a probable cause of delay.

At all types of institutions, PhDs most often indicate that many practical setbacks are the main cause of them expecting not to finish in time. At UMCs, PhDs mention this option relatively often compared to PhDs at universities and other types of institutions (52.2%). PhDs at UMCs also relatively often indicate that the planning of their project was too tight (45.5%) or that their project was too big (44.4%). PhDs at universities indicate relatively often that a lack of motivation (21.9%) or personal problems (17.7%) are causing delays.

Employee PhDs and scholarship PhDs both most often indicate that many practical setbacks are a reason that they do not expect to finish in time (45.4% and 46.5% respectively). Scholarship PhDs state relatively more often than employee PhDs that their delays are caused by lack of motivation (27.3%) and personal problems (23.6%). However, their progress is much less affected by teaching duties than the progress of employee PhDs, of whom 15.8% indicate that teaching is a reason they do not expect to finish in time. External PhDs most often give other reasons for not expecting to finish on time (61.1%), and other types of PhDs most often point toward too tight a planning (36.5%).

For both international and non-international PhDs, many practical setbacks are the most frequent reason for not expecting to finish in time. Furthermore, international PhDs often indicate that their project is too complex (30.1%) or that their supervision is insufficient (29.7%), while non-international PhDs more often indicate that the planning was too tight (36.8%) or that the project was too big (32.6%). International PhDs state relatively more often than non-international PhDs that a lack of motivation and personal problems are causing delays, or that they are completely stuck. Non-international PhDs' progress is more affected by teaching and side projects.

Finally, there are also quite some differences between disciplines in the reasons for the delays. While many practical setbacks are often or even most often mentioned in all disciplines, PhDs in Law less often mention this as the main reason for delay. Their progress is mostly hampered by teaching duties (40%), insufficient supervision (40%) or side projects (35%). PhDs in the Humanities relatively often indicate that they are completely stuck (17.2%), while PhDs in Medical and Health sciences think a too tight planning is the reason for their delays (41.7%). They are however least often affected by personal problems or lack of motivation (8.5%). PhDs in Economics and Business least often state that their project is too big (11.1%), but their progress is relatively often hampered by teaching (33.3%).

Magnitude of delay
To conclude, we asked the PhDs who indicated that they did not expect to finish on time or that they might or might not finish on time, how much more time they expect to need to finish their PhD project, in addition to their contract. Their responses can be found in figure 5.7. 42.9% of the PhDs indicate that they expect to need up to six months more to finish their PhD project, and the exact same proportion of PhDs expects to need between 6 and 12 months. This means that 14.1% of the PhDs who expect a delay expect to need more than one year to finish their projects, with a small minority even fearing to need two years or more.

The same question was also asked to PhDs whose formal PhD arrangement had already ended, but who are still finishing in their own time. Here, they were asked to count from the moment their formal agreement ended. Their responses can be found in figure 5.7 as well. 28% of these PhDs indicate to need less than six months, while 34% of them indicate to need between 6 and 12 months to finish their project. This conversely means that 38% of these

Still in formal arrangement
Finishing in own time

- 26; 4%
- 8; 1.2%
- 60; 9%
- 286; 43%
- 286; 43%

- 4; 8%
- 8; 16%
- 14; 28%
- 7; 14%
- 17; 34%

■ <6 months ■ 6-12 months ■ 12-18 months ■ 18-24 months ■ More than 24 months

Figure 5.7: Responses to the question: "How much more time do you expect to need to finish PhD project, in addition to your current trajectory?" for PhDs who were still in their formal arrangement (n=666) and PhDs who are finishing their project in their own time (n=50).

PhDs expect to need more than one year after their formal agreement to be able to finish their PhD project. 8% even indicate to needing more than two years.

Group differences in the magnitude of the delay
For the PhDs who are still in their formal PhD trajectory, we also look at group differences in the magnitude of the delay. These results are presented in figure 5.7. On average, male PhDs expect smaller delays than female PhDs. Women also almost twice as often indicate that they expect a delay of more than one year (16.7% versus 8.9%).

PhDs at UMCs often expect longer delays than PhDs at universities and other types of institutions, with 15.9% indicating to expect a delay of one year or more. PhDs at universities generally have delays of six months or less (44.8%) or between six and twelve months (41.7%).

External PhDs and other types of PhDs most often indicate that they expect a delay of one year or more (22.2% and 24% respectively). Scholarship PhDs also quite often expect a delay of more than one year (17%), but relatively often also indicate to expect a delay between 6 and 12 months. Employee PhDs delays are most often limited to six months or less.

International PhDs expect delays longer than one year more often than non-international PhDs (15.1% versus 13.5%). International PhDs however more often expect the delay to be limited to between 12 and 18 months (48.6%), while non-international PhDs most often indicate that their delay is limited to six months or less.

Finally, the magnitude of the delay also differs per discipline. PhDs in Technical Sciences and Engineering most often indicate they expect their delay to be limited to six months or less (60.5%), while PhDs in Law least often expect only short delays (28.6%). Their delays most often remain limited to between 6 and 12 months (52.4%). PhDs in Economics and Business most often expect delays of more than one year (22.2%).
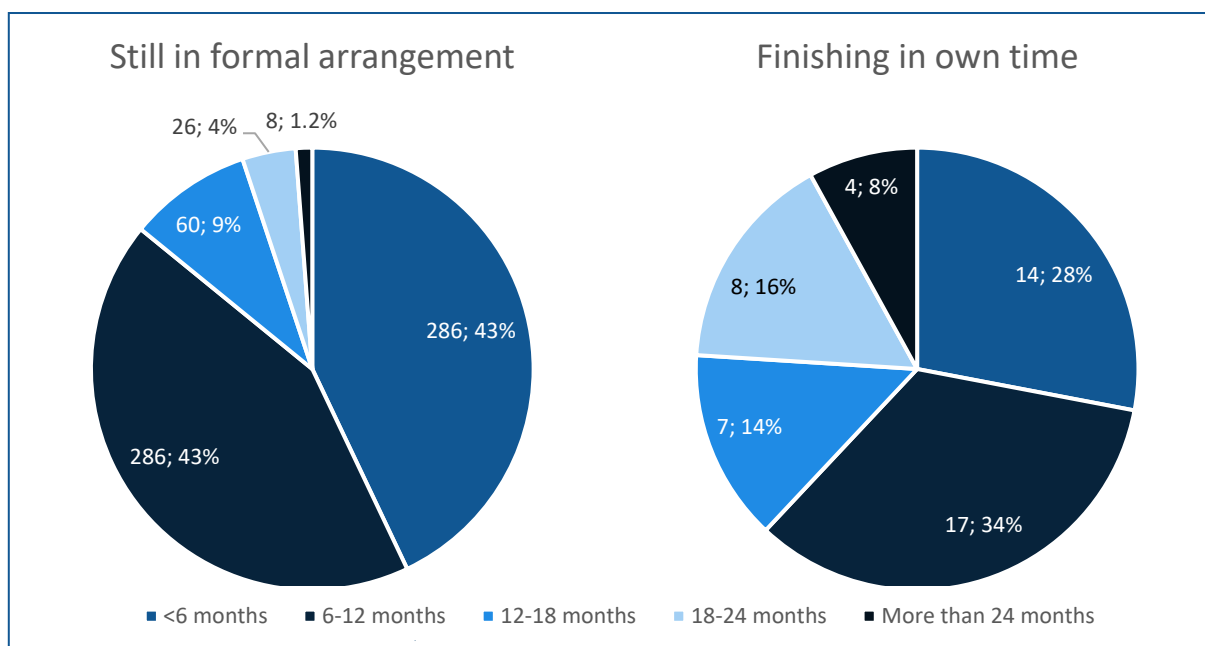
PNN PROMOVENDI NETWERK NEDERLAND
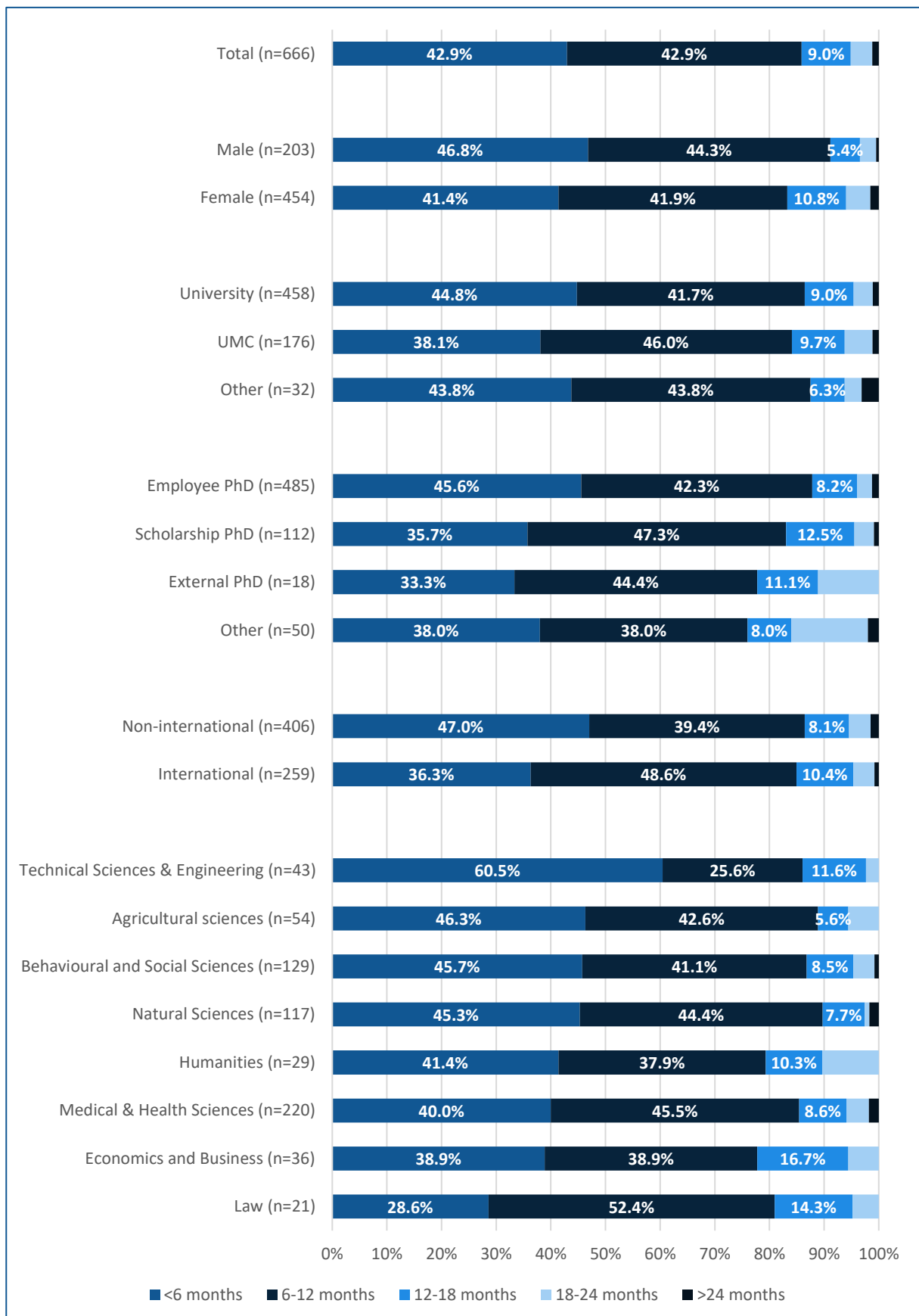
Figure 5.8: Responses to the question: "How much more time do you expect to need to finish PhD project, in addition to your current trajectory?" for PhDs who were still in their formal arrangement, per gender, type of institution, type of PhD arrangement, international status and discipline.

Considering quitting

Figure 6.1 shows the responses of the PhDs to the question whether they had ever considered quitting their PhD project. We show the total scores, but also those per gender, type of institution, type of PhD arrangement, international status and discipline. Of all PhDs, 41.6% have at least sometimes considered quitting their PhD project, the other 58,4% stated they never had. Of those 41.6%, 30.3%-point sometimes considered quitting, 6.7%-point often considered quitting, and 6% very often considered quitting with their PhD project.
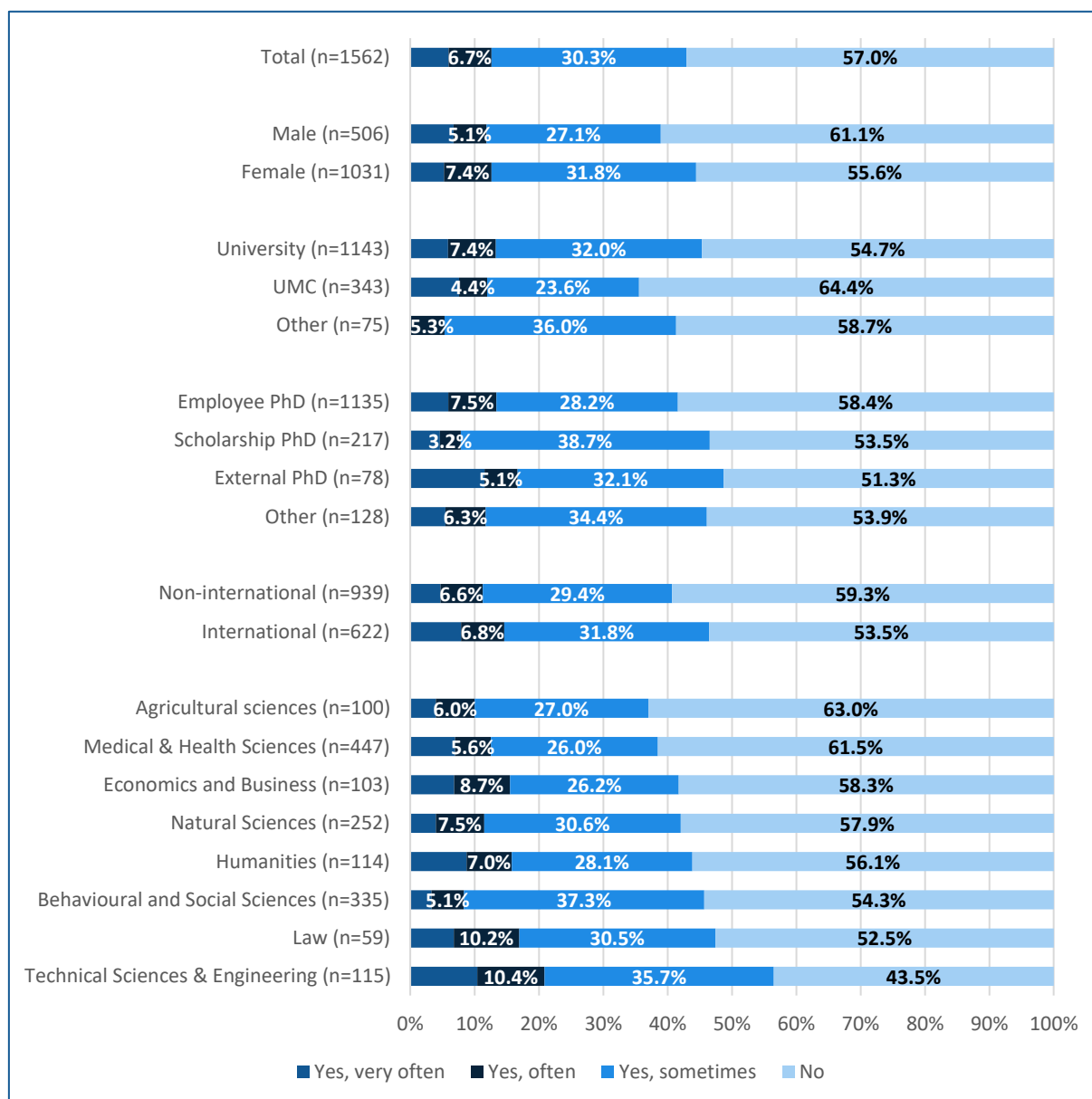
Figure 6.1: Resonses to the question: "Have you ever considered to quit your PhD project?", in total and per gender, type of institution, type of PhD arrangement, international status and discipline.

Group differences in considering to quit

Men haves consider quitting less often than women (61.1% versus 55.6%). Women relatively more often indicate to sometimes or often consider to quit their PhD projects. In contrast, men relatively more often than women indicate to very often consider to quit.

PhDs at universities and other types of institutions relatively more often indicate to consider quitting than PhDs at UMCs (45.3% and 41.3% versus 35.6%). PhDs at other types of institutions relatively often indicate that they sometimes consider to quit (36%), while PhDs at universities relatively often indicate that they often consider quitting their PhD project (7.4%).

PhDs at UMCs however relatively most often indicate that they very often consider quitting (7.6%).

Employee PhDs least often consider quitting (58.4%), compared to the three other types of PhDs. Scholarship PhDs and other types of PhDs relatively often state that they sometimes consider quitting (38.7% and 34.4% respectively), while external PhDs relatively most often indicate that they very often consider quitting (11.5%).

International PhDs are more likely to consider quitting their PhD project than non-international PhDs (46.5% versus 40.7%). 7.9% of the international PhDs states that they very often consider to quit, while this is only the case for 4.7% of the non-international PhDs.

Looking at the differences between disciplines, PhDs from Technical Sciences and Engineering considered quitting most often, with only 43,5% never considering quitting their PhD project. PhDs in Agricultural sciences least often indicate that they consider quitting (37%). PhDs in Behavioural and social sciences relatively often indicate that they sometimes consider quitting (37.3%), but relatively least often indicate that they very often consider quitting their PhD project (3.3%). PhDs in Humanities and Technical sciences and engineering relatively most often indicate that they very often consider quitting (8.8% and 10.4% respectively).

Reasons for considering quitting

We asked all PhDs who indicated ever considering quitting about the reasons why they did so. The reasons for thinking about quitting their PhD project are shown in figure 6.2. Doubts about academia was mentioned most often, by 57.3% of the PhD's. If we generalize this to all participants in the survey, this means that 24% of the PhDs have considered quitting because they have doubts about academia.
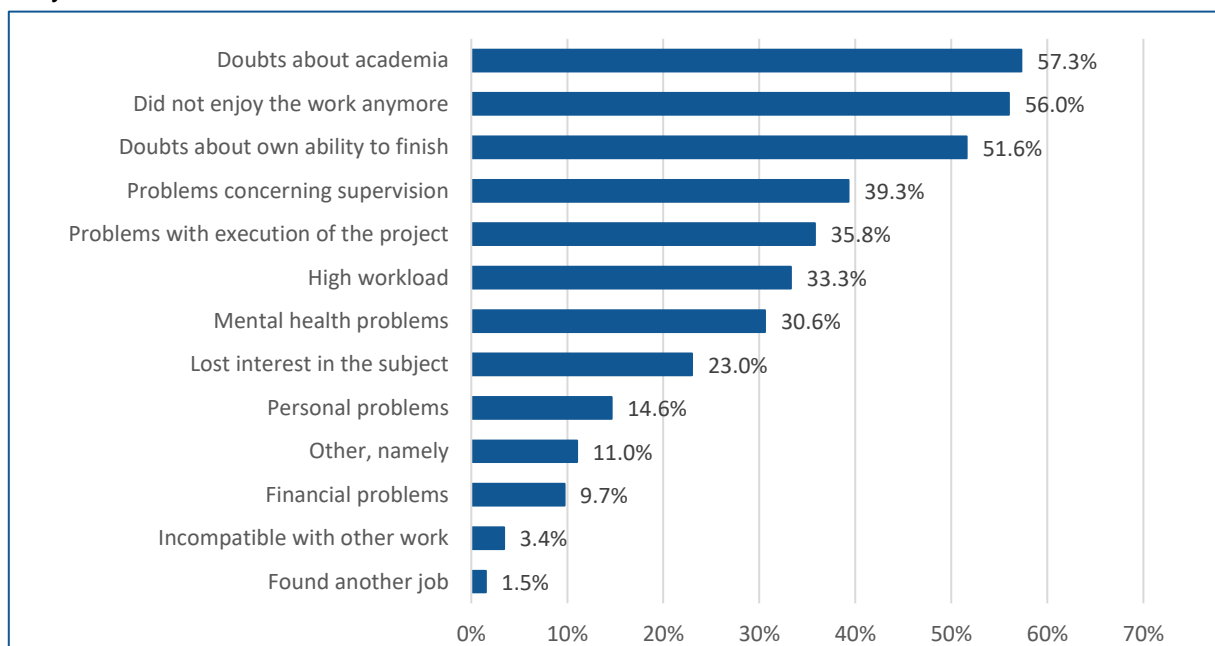
Figure 6.2: Responses to the question: "Why did you ever consider quitting your project?" (n=670).

56% of the PhDs who ever considered quitting stated that not enjoying the work anymore was the reason they thought about quitting, and 51.6% doubted their own ability to finish, which made them consider quitting. Other relatively common reasons for considering quitting are problems concerning supervision (39.3%), problems with the execution of the project (35.8%) and a high workload (33.3%). Furthermore, 30.6% of the PhDs who ever considered quitting indicated that mental health problems were a reason for this. This means that 12.8% of all participants in this survey ever considered quitting because of mental health problems.

Group differences in reasons for considering quitting

Groups of PhDs differ in the reasons why they consider quitting their PhD project. We investigated group differences based on gender, type of institution, type of PhD arrangement, international status and discipline. Due to the large number of reasons and groups, these results cannot always be visualized. We therefore include the results in table A3 in the appendix, and briefly discuss the most striking results here.

There are minor differences between men and women in the reasons why they ever considered quitting. Men most often indicate doubts about academia, while women most often indicate that they did not enjoy the work anymore. Women also more often mentioned doubts about their own abilities to finish, the high workload and mental health problems as reasons for quitting their PhD project, while men relatively more often indicated problems with the execution of the project, lost interest in the subject, and financial problems as reasons.

Reasons for considering quitting the PhD project differed slightly between the institutions. PhDs from UMCs mentioned not enjoying the work anymore and problems concerning supervision more often than PhDs at universities or other types of institutions. Doubts about academia, mental health problems and losing interest in the subject were relatively more often given as a reason by the university PhDs. Other types of PhDs were most often concerned about their own ability to finish, but relatively less often considered quitting because of problems concerning supervision.

There were quite some differences between the different types of PhDs in the reasons for considering quitting their PhD projects. Employee PhDs mentioned doubts about the academia, not liking the work anymore and problems concerning supervision more often than the three other types of PhDs. However, they almost never mentioned financial problems as a reason for considering quitting, while this was a reason for over one third of the scholarship PhDs. External PhDs mentioned financial problems relatively often as well, but they also relatively often mentioned that their PhD project was incompatible with other work.

Between international and non-international PhDs, there are some minor differences in the reasons why they ever considered quitting their PhD project. International PhDs most often have doubts about academia, while non-international PhDs most often indicate that they did not enjoy the work anymore. International PhDs relatively often mention mental health problems, losing interest in the subject, or personal problems as reasons. They also indicate financial problems much more often than non-international PhDs as a reasons to consider quitting. Non-international PhDs relatively more often indicate a high workload as a reason.

Finally, PhDs from various disciplines have different reasons why they consider quitting their PhD projects. PhDs in the Humanities most of all disciplines indicate that they consider quitting because they had doubts about academia. PhDs in Economics and business relatively most often state that they did not enjoy the work anymore, while PhDs in Law and Natural sciences relatively most often indicate that doubts about their own ability to finish were a reason to consider quitting their PhD project. PhDs in Law also relatively most often indicate problems concerning supervision and mental health problems. PhDs in Agricultural sciences least often indicate that mental health problems were a reason to consider quitting their PhD projects.

General experiences concerning wellbeing

PhDs were also asked to elaborate on their answers concerning wellbeing in an open question. 320 PhDs responded to this question. These answers were manually coded into topics, and we will discuss the results per topic here.

Mental health problems

Many PhDs who responded to this question reported either mild mental health problems (n=96) or more severe mental health problems (n=64). Concerning the severe mental health problems, 25 PhDs were diagnosed with depression or burn-out, of which 3 PhDs with both. PhDs also dealt with severe stress (n=12), feelings of anxiety or panic attacks (n=6) and frustration (n=6). Some PhDs felt tired or unhappy, or guilty for not being able to stay on track.

> *"I am currently ill (burn-out and depression) since November. It was mostly stress, a lot of tensions at the department between professors, and a complete loss in confidence and constant thinking I was a complete failure that led to this decision to call in sick."* (R.78, female, employee PhD).

> *"Since this PhD my sense of self-worth has definitely gone down the drain. I have recently submitted a draft article, and have to start a new one. It all seems to insurmountable that I find it difficult to know where to start. I then procrastinate, and feel worse about myself. This spirals down where I feel huge anxiety about myself and my work, which then makes it more difficult to do work. This leads me to feel paralysed. This is how I have felt for the majority of the last four years."* (R.247, male, scholarship PhD)

When it comes to milder mental health problems, 11 PhDs reported stress, while 7 explained that they felt a lack of concentration or motivation (sometimes caused by COVID-19), and another 7 felt lazy, tired or disappointed. PhDs also indicated that doing their PhDs was 'no fun' anymore and were experiencing sincere ups and downs (n=12). Ten PhDs furthermore experienced mental health issues due to personal problems or work-life balance.

A substantial group of PhDs (n=21) felt that they had lost track of their confidence during their PhD trajectory, and 5 indicated to feel like an impostor in science. Several PhDs found it hard to deal with the critical responses of their supervisors to their papers and proposals.

> *"Doing a PhD is a challenge: challenge for my mental and physical health. It requires conscious and constant effort to keep confidence (to myself and skills) and moral high. I was aware of this before starting, but now I get to realize it and experience it. Still the excitement and love for the field I am in helps me overcome these problems."* (R. 51, female, employee PhD)

> *"In general: not being able to also do the practical side of my job really enhances the imposter syndrome feeling."* (R.196, male, employee PhD).

> *"I feel like my PhD progress is never good enough. I feel like I am constantly doing a lot of things that are never sufficient enough. My data is not good enough. My analysis is wrong. My writing is not good enough for publication. I wish that my supervisor and my promotor would help me more with the writing. But they are busy. And I know they try to be helpful. Still most of the time I feel like I am alone in this battle. I still have motivation to graduate, but I am not sure if I am good enough to do it."* (R.111, female, scholarship PhD)

Eight PhDs mentioned that they had sought professional help and were recovering or already recovered from their mental health problems.

> *"I needed to seek psychological counselling due to the adverse effects that my PhD-project had on me. Specifically, how my supervisor treated me had a strong negative impact on my mental health."* (R.155, female, employee PhD)

> *"Last year I experienced these problems, and sought out professional help. Ever since I know how to deal with these issues better."* (R.210, male, employee PhD).

Progress

76 PhDs elaborated on the progress of their PhD project. 35 of them indicated that they were worried about their progress, for instance because they felt time pressure because of slow progress (n=14), or because they were procrastinating on their work (n=6), or felt that the deadline was coming too soon. Several PhDs mentioned that they experienced many practical problems and setbacks.

> *"I have been working on a rather hard problem for the past few weeks, so progress is slow and days are long and not very productive."* (R.140, male, employee PhD).

> *"I'm getting closer to the end of my trajectory, and there are still many things to do, recently it feels like there is just too much to be done and not enough time. This comes in part due to the lack of cooperation of a colleague that was supposed to take over the project, followed by her pregnancy leave, leaving a lot of pressure on me."* (R.181, female, employee PhD)

> *"While I consider myself to be a happy and emotionally healthy person, I am quite hard on myself and am a worrier. The corona crisis has not been great for my mental health, although I am coping okay. I worry about being able to complete my PhD in time because I can't move forward with my research as planned at the moment."* (R.316, female, other type of PhD)

Supervision

Supervisors were also a common topic in these open answers, as 34 PhDs referred explicitly to their supervisors. Five of them were positive, explaining how helpful and responsive their supervisors are. However, 29 of them expressed negative considerations about their supervisor in relation to their wellbeing, in different gradations. For five of these PhDs, the problems were relatively small, for instance that the supervisor is too direct or has a different research style than the PhD.

> *"I am not really insecure, but I think the way my PhD research is organized (most of the time I am working and thinking alone to perform my research, and receive support once in two weeks from co-promotor), makes it an unnecessarily solitary activity. Doing research together seems more helpful for changing practice and more fulfilling to me."* (R89, female, other type of PhD).

19 PhDs however mentioned serious problems, indicating that their supervisors severely damaged their wellbeing. Their supervisors for instance did not provide them with support or confidence.

> *"All these in combination with less active lifestyle and manuscript deadlines make me nervous sometimes. Especially when my supervisors send their feedbacks which is (expectedly) over critical and tend to be harsh. This can be an easy trigger to go down the hill of self-doubt. I believe in the absence of corona pandemic, these things won't bother me as much because I normally do have more mental resilience."* (R34, male, employee PhD).

"I lose confidence in myself in waves as a PhD is basically one round of criticism after another and one of my supervisors is very direct "Dutch" and I have a tendency to take things personally. […]" (R.151, female, employee PhD).

Five PhDs reported very severe problems, and stated that their supervisor was abusive, disgraceful, showed no interest or had actually stopped the supervision process.

"I had an incompetent and verbally abusive supervisor which isolates his PhD students. During my PhD I lost track on reality. Eventually I had the courage to switch from supervisors just before writing my dissertation. I am still recovering." (R.128, female, external PhD).

"Had to pause my PhD because of being close to a burnout. My supervisors do not agree on anything and are sending me in different directions. One of them is constantly complaining about the other. It was very frustrating." (R.69, female, employee PhD)

COVID-19

Of course, COVID-19 has not left the wellbeing of the PhDs in our survey unaffected. Even though we had asked the PhDs to filter COVID-19 out of their responses as much as possible, COVID-19 was a common topic in the open responses concerning wellbeing. 81 PhDs made some mention of COVID-19 or Corona. Five of them had positive experiences, indicating that the quietness of the crisis helped them to reconsider their research.

"Now that there is a 'time stop' on things I keep rethinking my previous work and realized that I made quite some mistakes previously by going with the flow and not thinking critically enough." (R.236, female, employee PhD).

The 76 other PhDs however indicated that COVID-19 had negatively affected their wellbeing. While five PhDs only experienced mild effects, 65 of them reported serious consequences of the lockdown. Five PhDs feared that they could not continue their research, and nine others reported other types of delay. Several PhDs indicated that they had to take care of their young children, which made it hard to keep a proper work-life balance (n=13).

"The stress of the world currently being disrupted, and still being expected to be productive in research work, without access to my lab and courses/conferences I was supposed to follow/go to, combined with no clarity at all if we might get extensions/less strict requirements, is very stressful in my opinion. I don't think it is normal to expect business to be as usual now, but I feel quite alone in my department with that view." (R.276, female, employee PhD).

"I tried to leave corona out of it, but that is almost impossible. As it very much impacts focus (I have a toddler at home). […]" (R.170, female, employee PhD).

"Working from home with an infant is almost impossible without a babysitter, so my productivity and concentration are at an all-time low." (R.319, female, employee).

Appendix

Table A1: Responses to the question: "Who or what do you think is responsible for a high workload or time pressure?"

	Amount of work	Perfectionism	Pressure to publish	Difficulty of work	Interruptions during work	Deadlines	Teaching duties or student supervision	Contact with supervisor(s)	Other duties not related to the PhD study	Loss of interest/ motivation	Work speed	Difficulties in personal life	Courses and other education activities	Other, namely…	Equipment you use	Parttime PhD	Contact with colleagues	Caregiving tasks	Contact with students	Unfavourable working hours	Mean number of reasons	Standard Deviation number of rerasons
Total (n=951)	63.8%	49.6%	44.7%	41.3%	36.1%	33.5%	31.5%	31.3%	26.5%	24.0%	22.7%	20.8%	19.1%	12.9%	12.2%	11.8%	11.6%	7.6%	5.9%	4.6%	5.12	2.18
High workload (n=777)	61.5%	50.5%	43.2%	42.0%	36.2%	34.4%	31.7%	29.0%	25.4%	24.6%	23.3%	20.2%	18.5%	12.1%	10.8%	11.2%	10.4%	7.5%	5.4%	4.8%	5.02	2.13
Very high workload (n=174)	74.1%	46.0%	51.1%	38.5%	35.6%	29.9%	31.0%	42.0%	31.6%	21.3%	20.1%	23.6%	21.8%	16.7%	18.4%	14.4%	16.7%	8.0%	8.0%	4.0%	5.53	2.36
Male (n=303)	58.4%	44.6%	42.6%	44.9%	31.4%	30.4%	29.7%	28.1%	26.4%	25.7%	18.8%	19.5%	17.5%	12.5%	12.2%	12.2%	11.2%	6.9%	5.9%	3.3%	4.82	2.14
Female (n=631)	66.4%	51.5%	45.3%	39.0%	38.2%	35.8%	32.2%	32.8%	26.6%	22.5%	24.2%	21.4%	19.8%	13.5%	12.5%	11.9%	11.9%	8.1%	5.5%	5.1%	5.63	2.42
University (n=699)	59.8%	48.8%	43.2%	43.9%	35.1%	30.5%	35.5%	30.2%	25.2%	25.8%	23.7%	21.9%	19.6%	13.6%	12.4%	11.4%	10.6%	8.0%	6.6%	3.9%	5.10	2.23
UMC (n=209)	76.1%	52.2%	50.7%	33.5%	37.3%	42.6%	19.6%	34.0%	30.1%	20.1%	18.7%	18.2%	17.7%	10.5%	11.0%	11.5%	15.3%	6.2%	2.9%	6.2%	5.14	1.94
Other (n=42)	69.0%	52.4%	40.5%	38.1%	45.2%	40.5%	26.2%	38.1%	31.0%	14.3%	23.8%	14.3%	19.0%	14.3%	14.3%	19.0%	7.1%	7.1%	9.5%	9.5%	5.33	2.49
Employee PhD (n=700)	66.6%	52.7%	44.7%	41.3%	36.9%	33.7%	37.9%	32.4%	24.6%	23.1%	22.9%	20.0%	19.6%	13.0%	13.1%	5.7%	12.4%	6.1%	6.3%	4.4%	5.17	2.13
Scholarship PhD (n=129)	54.3%	45.7%	56.6%	50.4%	36.4%	36.4%	13.2%	30.2%	23.3%	30.2%	29.5%	26.4%	18.6%	11.6%	13.2%	10.9%	10.9%	7.8%	6.2%	5.4%	5.17	2.45
External PhD (n=43)	44.2%	32.6%	37.2%	34.9%	18.6%	25.6%	0.0%	30.2%	44.2%	30.2%	18.6%	23.3%	7.0%	18.6%	2.3%	60.5%	4.7%	16.3%	2.3%	7.0%	4.58	2.14
Other (n=77)	64.9%	37.7%	28.6%	28.6%	37.7%	29.9%	22.1%	23.4%	40.3%	16.9%	13.0%	15.6%	22.1%	9.1%	7.8%	41.6%	9.1%	15.6%	3.9%	3.9%	4.71	2.09

Table A1: Responses to the question: "Who or what do you think is responsible for a high workload or time pressure?" (continued)

	Amount of work	Perfectionism	Pressure to publish	Difficulty of work	Interruptions during work	Deadlines	Teaching duties or student supervision	Contact with supervisor(s)	Other duties not related to the PhD study	Loss of interest/ motivation	Work speed	Difficulties in personal life	Courses and other education activities	Other, namely…	Equipment you use	Parttime PhD	Contact with colleagues	Caregiving tasks	Contact with students	Unfavourable working hours	Mean number of reasons	Standard Deviation number of reasons
Non-international (n=566)	70.0%	52.3%	42.0%	38.3%	36.9%	34.5%	35.5%	30.6%	29.7%	19.1%	19.1%	18.4%	18.7%	13.4%	10.2%	16.6%	10.2%	8.7%	6.0%	4.4%	5.15	2.10
International (n=384)	54.7%	45.8%	48.7%	45.6%	34.6%	32.0%	25.8%	32.3%	21.6%	31.3%	27.9%	24.2%	19.5%	12.2%	15.1%	4.7%	13.5%	6.0%	5.7%	4.9%	5.06	2.28
Agricultural sciences (n=60)	71.7%	50.0%	41.7%	38.3%	41.7%	23.3%	30.0%	26.7%	23.3%	20.0%	28.3%	18.3%	20.0%	15.0%	21.7%	13.3%	10.0%	11.7%	13.3%	1.7%	5.20	2.29
Behavioural and Social Sciences (n=206)	59.7%	49.5%	42.2%	39.3%	35.4%	27.2%	32.5%	32.5%	34.5%	21.4%	17.5%	22.3%	20.4%	14.6%	6.8%	23.3%	8.7%	13.1%	5.8%	1.9%	5.09	2.07
Economics and Business (n=62)	64.5%	35.5%	35.5%	43.5%	25.8%	30.6%	38.7%	33.9%	17.7%	32.3%	21.0%	21.0%	17.7%	12.9%	6.5%	6.5%	11.3%	4.8%	9.7%	0.0%	4.69	2.18
Humanities (n=74)	67.6%	47.3%	39.2%	51.4%	32.4%	33.8%	31.1%	23.0%	32.4%	23.0%	21.6%	28.4%	14.9%	21.6%	8.1%	6.8%	10.8%	9.5%	1.4%	0.0%	5.04	2.68
Law (n=39)	51.3%	56.4%	33.3%	35.9%	35.9%	30.8%	41.0%	28.2%	41.0%	23.1%	20.5%	30.8%	20.5%	12.8%	0.0%	10.3%	12.8%	5.1%	12.8%	2.6%	5.05	2.09
Medical & Health Sciences (n=277)	76.5%	53.8%	46.6%	38.6%	37.9%	44.8%	28.2%	33.6%	27.1%	21.7%	22.0%	17.0%	22.7%	9.7%	16.6%	10.5%	13.7%	6.1%	2.5%	7.9%	5.38	1.98
Natural Sciences (n=150)	53.3%	50.0%	50.0%	46.0%	32.0%	30.0%	32.7%	30.0%	14.7%	27.3%	28.7%	21.3%	16.0%	12.7%	12.0%	6.7%	10.0%	2.7%	8.0%	6.0%	4.90	2.25
Technical Sciences & Engineering (n=62)	43.5%	45.2%	53.2%	43.5%	48.4%	30.6%	32.3%	32.3%	19.4%	33.9%	24.2%	17.7%	12.9%	6.5%	17.7%	0.0%	19.4%	1.6%	6.5%	8.1%	4.97	2.50

Table A2: Responses to the question: ""What are the main causes due to which you expect that you might or will not finish on time?"

	Many practical setbacks	Too tight planning	Other	Side projects	Too big project	Too complex project	Insufficient supervision	Lack of motivation	Personal problems	Teaching	Illness	Supervisor keeps expanding the project	I am completely stuck	Pregnancy
Total (n=668)	43.6%	32.0%	30.5%	29.5%	29.5%	27.1%	23.4%	18.0%	14.4%	13.3%	12.3%	11.4%	10.2%	6.9%
Male (n=201)	42.8%	28.4%	29.9%	33.3%	24.4%	29.4%	21.4%	21.4%	14.9%	15.9%	5.0%	10.9%	10.9%	0.5%
Female (n=458)	43.9%	33.4%	31.2%	27.9%	31.2%	26.2%	24.0%	16.2%	13.8%	12.2%	15.1%	11.6%	9.2%	9.8%
University (n=457)	40.5%	27.1%	32.8%	26.7%	23.2%	26.0%	25.2%	21.9%	17.7%	16.8%	14.0%	9.8%	10.5%	6.6%
UMC (n=178)	52.2%	45.5%	25.8%	37.1%	44.4%	29.8%	19.1%	8.4%	6.7%	3.9%	7.3%	15.2%	10.1%	7.9%
Other (n=33)	39.4%	27.3%	24.2%	27.3%	36.4%	27.3%	21.2%	15.2%	9.1%	15.2%	15.2%	12.1%	6.1%	6.1%
Employee PhD (n=487)	45.4%	35.1%	29.6%	31.8%	32.6%	27.5%	22.8%	15.8%	12.7%	15.8%	12.5%	11.1%	9.4%	7.6%
Scholarship PhD (n=110)	46.4%	20.0%	30.0%	23.6%	17.3%	24.5%	24.5%	27.3%	23.6%	4.5%	9.1%	10.0%	13.6%	2.7%
External PhD (n=18)	5.6%	11.1%	61.1%	16.7%	22.2%	27.8%	22.2%	22.2%	16.7%	5.6%	16.7%	11.1%	11.1%	16.7%
Other (n=52)	32.7%	36.5%	28.8%	25.0%	28.8%	28.8%	26.9%	17.3%	9.6%	11.5%	15.4%	17.3%	7.7%	5.8%
Non-international (n=408)	41.2%	36.8%	28.9%	33.8%	34.8%	25.0%	19.1%	13.5%	10.0%	15.4%	13.2%	11.8%	7.4%	9.6%
International (n=259)	47.1%	24.3%	33.2%	22.4%	21.2%	30.1%	29.7%	25.1%	20.8%	9.7%	10.8%	10.8%	14.3%	2.7%
Agricultural sciences (n=55)	41.8%	18.2%	34.5%	20.0%	21.8%	20.0%	16.4%	20.0%	14.5%	5.5%	9.1%	9.1%	16.4%	10.9%
Behavioural and Social Sciences (n=129)	31.0%	35.7%	37.2%	26.4%	25.6%	27.9%	24.0%	20.2%	19.4%	16.3%	17.1%	9.3%	8.5%	13.2%
Economics and Business (n=36)	47.2%	33.3%	33.3%	27.8%	11.1%	25.0%	19.4%	19.4%	27.8%	33.3%	8.3%	16.7%	8.3%	0.0%
Humanities (n=29)	34.5%	13.8%	24.1%	31.0%	41.4%	24.1%	37.9%	27.6%	31.0%	17.2%	24.1%	3.4%	17.2%	6.9%
Law (n=20)	10.0%	15.0%	25.0%	35.0%	20.0%	5.0%	40.0%	30.0%	25.0%	40.0%	30.0%	5.0%	10.0%	15.0%
Medical & Health Sciences (n=223)	53.8%	41.7%	25.6%	37.2%	43.9%	27.8%	21.1%	8.5%	6.7%	6.3%	8.5%	16.6%	8.5%	6.7%
Natural Sciences (n=115)	44.3%	25.2%	28.7%	23.5%	18.3%	28.7%	27.0%	20.9%	11.3%	13.9%	10.4%	7.0%	9.6%	2.6%
Technical Sciences & Engineering (n=43)	48.8%	27.9%	34.9%	30.2%	23.3%	34.9%	23.3%	34.9%	18.6%	18.6%	14.0%	11.6%	7.0%	0.0%

	Doubts about academia	Did not enjoy the work anymore	Doubts about own ability to finish	Problems concerning supervision	Problems with the execution of the project	High workload	Mental health problems	Lost interest in subject	Personal problems	Other	Financial problems	Incompatible with other work	Found another job
Total (n=670)	57.3%	56.0%	51.6%	39.3%	35.8%	33.3%	30.6%	23.0%	14.6%	11.0%	9.7%	3.4%	1.5%
Male (n=198)	59.6%	52.5%	48.0%	39.4%	40.9%	29.3%	27.3%	25.8%	14.1%	12.6%	12.6%	5.1%	1.5%
Female (n=456)	56.4%	57.7%	52.9%	39.7%	33.8%	35.1%	31.4%	21.7%	14.3%	10.1%	8.6%	2.9%	1.5%
University (n=518)	58.5%	56.0%	51.4%	39.0%	34.7%	31.7%	31.5%	24.7%	15.8%	10.8%	11.0%	3.7%	1.5%
UMC (n=121)	54.5%	58.7%	50.4%	44.6%	40.5%	38.8%	28.9%	17.4%	9.9%	8.3%	5.8%	3.3%	1.7%
Other (n=31)	48.4%	45.2%	61.3%	22.6%	35.5%	38.7%	22.6%	16.1%	12.9%	25.8%	3.2%	0.0%	0.0%
Employee PhD (n=472)	61.2%	61.2%	51.7%	42.4%	37.5%	33.9%	33.7%	22.9%	13.8%	8.7%	3.4%	1.7%	1.5%
Scholarship PhD (n=101)	52.5%	48.5%	51.5%	27.7%	36.6%	32.7%	23.8%	22.8%	18.8%	17.8%	34.7%	4.0%	0.0%
External PhD (n=39)	38.5%	33.3%	51.3%	38.5%	30.8%	15.4%	15.4%	17.9%	17.9%	15.4%	25.6%	20.5%	5.1%
Other (n=57)	45.6%	42.1%	52.6%	35.1%	24.6%	42.1%	28.1%	28.1%	12.3%	14.0%	7.0%	5.3%	1.8%
Non-international (n=381)	58.0%	61.2%	52.2%	38.8%	34.6%	37.8%	29.1%	20.2%	12.3%	11.0%	3.7%	4.2%	1.8%
International (n=289)	56.4%	49.1%	50.9%	39.8%	37.4%	27.3%	32.5%	26.6%	17.6%	11.1%	17.6%	2.4%	1.0%
Agricultural sciences (n=35)	45.7%	54.3%	48.6%	40.0%	28.6%	34.3%	14.3%	17.1%	11.4%	8.6%	11.4%	2.9%	5.7%
Behavioural and Social Sciences (n=154)	64.3%	52.6%	53.2%	37.0%	30.5%	32.5%	32.5%	21.4%	14.9%	11.0%	14.9%	5.8%	1.3%
Economics and Business (n=43)	65.1%	62.8%	51.2%	37.2%	37.2%	30.2%	30.2%	27.9%	16.3%	14.0%	9.3%	7.0%	0.0%
Humanities (n=50)	76.0%	60.0%	46.0%	42.0%	30.0%	36.0%	36.0%	22.0%	24.0%	22.0%	16.0%	2.0%	2.0%
Law (n=28)	57.1%	46.4%	57.1%	50.0%	25.0%	25.0%	42.9%	17.9%	25.0%	10.7%	14.3%	7.1%	3.6%
Medical & Health Sciences (n=172)	51.2%	60.5%	48.8%	44.8%	40.7%	41.9%	30.8%	18.0%	7.0%	7.0%	4.7%	2.3%	0.6%
Natural Sciences (n=105)	51.4%	58.1%	56.2%	33.3%	43.8%	26.7%	27.6%	33.3%	21.0%	12.4%	7.6%	1.9%	1.0%
Technical Sciences & Engineering (n=65)	55.4%	50.8%	53.8%	40.0%	35.4%	27.7%	35.4%	29.2%	13.8%	10.8%	1.5%	1.5%	0.0%

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