Grant application full proposal form 2021

NWO Talent Programme – Veni scheme

Health Research and Development (ZonMw)

1. Public summary of your research proposal

Please provide both an English (ENG) and a Dutch (NL) version (max. fifty words each), including an English and Dutch popular title.

NL

Projecttitel: Mensen die niet digitaal vaardig zijn zouden toch gebruik moeten kunnen maken van E-Health om gezondheidsverschillen te voorkomen
Dr. E.I.Metting, Universitair Medisch Centrum Groningen
In de zorg wordt steeds vaker gebruik gemaakt van E-Health om patiënten beter te kunnen behandelen. Hierdoor zal de behandeling en de gezondheid van niet digitaal vaardigen achterblijven. Met COPD patiënten en zorgverleners ga ik een methode ontwikkelen waarmee niet digitaal vaardigen tóch kunnen profiteren van de gezondheidsvoordelen van E-Health.
Word count: 50

ENG

Project title: Reducing health inequalities by opening up E-Health access for digitally non-skilled people
Dr. E.I.Metting, University Medical Center Groningen
The healthcare sector increasingly uses E-Health to improve treatment. As a result, the treatment and resulting health of non-digitally skilled persons is lagging behind. Together with COPD patients and care providers, I will develop a method that will enable non-digitally skilled people to benefit from the health advantages of E-Health.
Word count: 50

2. Research proposal

2a. Description of the proposed research (weight 40%)

2a1. Overall aim and key objective

Policy makers including the European Commission consider **E-Health (use of technology in healthcare) an important healthcare priority** (1) and healthcare providers are increasingly using E-Health in the diagnosis and treatment of patients. This leads to better health outcomes, particularly because care can be tailored to individuals. Unfortunately, **Digitally Illiterate People (DIPs) are missing out** (2) and have therefore reduced access to optimal healthcare. E-Health can improve health especially in chronic patients (3,4) because symptoms vary over the day and medical assessments are always a snapshot of reality. This complicates clinical decision-making and stresses the relevance and opportunities of E-Health. There are different type of E-Health including tele-monitoring, self-management apps, online disease information or video-conversations. COVID-19 increased the gap between digital literate people and DIPs due to an acceleration of E-Health use (5–9). Access to healthcare is a **human right** (10) and it is therefore **urgently needed** to find solutions for DIPs.

Digital illiteracy is not the same as health illiteracy: people with good health literacy can still have poor digital literacy (11). The proportion of DIPs is high in **older populations (>65 years), in lower educated people and in ethnic minorities** even in countries where most household are connected to Internet (table 1). Chronic diseases are also common in older and lower educated people (12), hence this group can benefit most from E-Health but are in general less capable to use it due to the high proportion of DIPs.

Table 1: Differences between 3 European countries regarding people with basic/above digital skills (13)

	Proportion of people with basic or above digital skills		
Group	**Netherlands**	**Germany**	**United Kingdom**
Households with Internet access (2019)	98%	95%	96%
25-54 years high education (2019)	96%	94%	95%
55-74 years high education (2019)	89%	74%	84%
25-54 years low education (2019)	64%	45%	39%
55-74 years low education (2017)	36%	20%	16%
Non-EU born (2019)	73%	58%	72%
Retired (2019)	57%	44%	44%
Unemployed (2019)	85%	54%	68%

Tailored and theory based decision support methods can help professionals to engage DIPs but are currently not existing (14,15) because DIPs are often not included in intervention studies. There therefore insufficient knowledge about DIPs' barriers and facilitators (15). Moreover, most E-Health studies were performed in the USA and results are not necessarily generalizable to Europe (14).

I have performed qualitative and quantitative (pilot) studies regarding E-Health access for DIPs (16–18). These studies showed that **some DIPs were able to use E-Health because they found solutions** to overcome their poor digital skills, for example by engaging digital skilled family members. DIPs mentioned various barriers and facilitators of E-Health that can be divided into: contextual factors (e.g. social support), communicative experience (e.g. ability communicate with healthcare provider), individual factors (e.g. disease), system factors (e.g. app) or interaction between user and technology (e.g. poor vision) (19,20). It is **essential to get in contact with DIPs** to find tailored solutions to engage them in E-Health and reduce the increasing gap between digital literate people and DIPs.

Theoretical background

Theoretical concepts can be used in decision support methods and interventions (15). The most leading theories are the "Lily model" (21)), "E-Health Literacy Model" (ELM, figure 1 (21)) and "E-Health Literacy Framework" (ELF, figure 2 (19). The Lily model provides an overview of different types of literacy (see flower in figure 1). ELF consists of 7 E-Health literacy domains divided in 3 dimensions (figure 2). In the E-Health Literacy Model (ELM, figure 1 (21)) contextual and communicative experience are added to the Lily model. The E-Health Literacy Questionnaire (eHLQ) measures the 7 domains from the ELF (19).

In my study I will combine the 7 domains of the ELF (eHLQ) with the contextual and communicational concepts from the ELM to develop a decision support method for healthcare professionals to engage DIPs in E-Health.

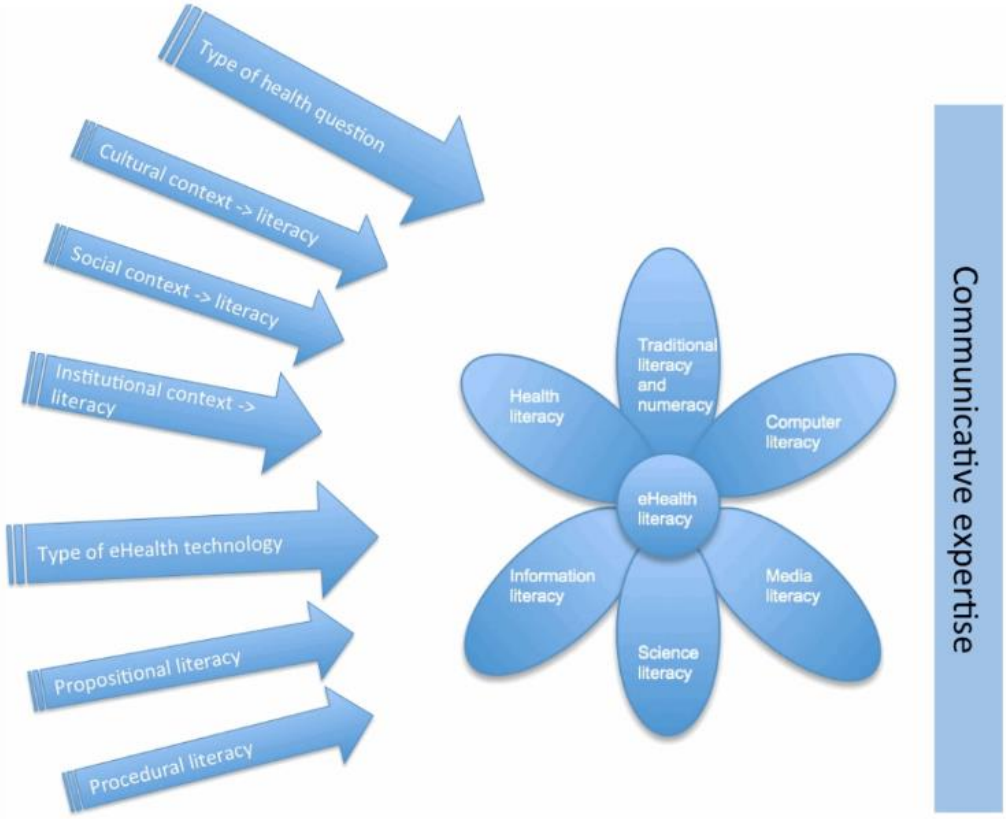

Figure 1: the E-Health Literacy Model (ELM, 2014)

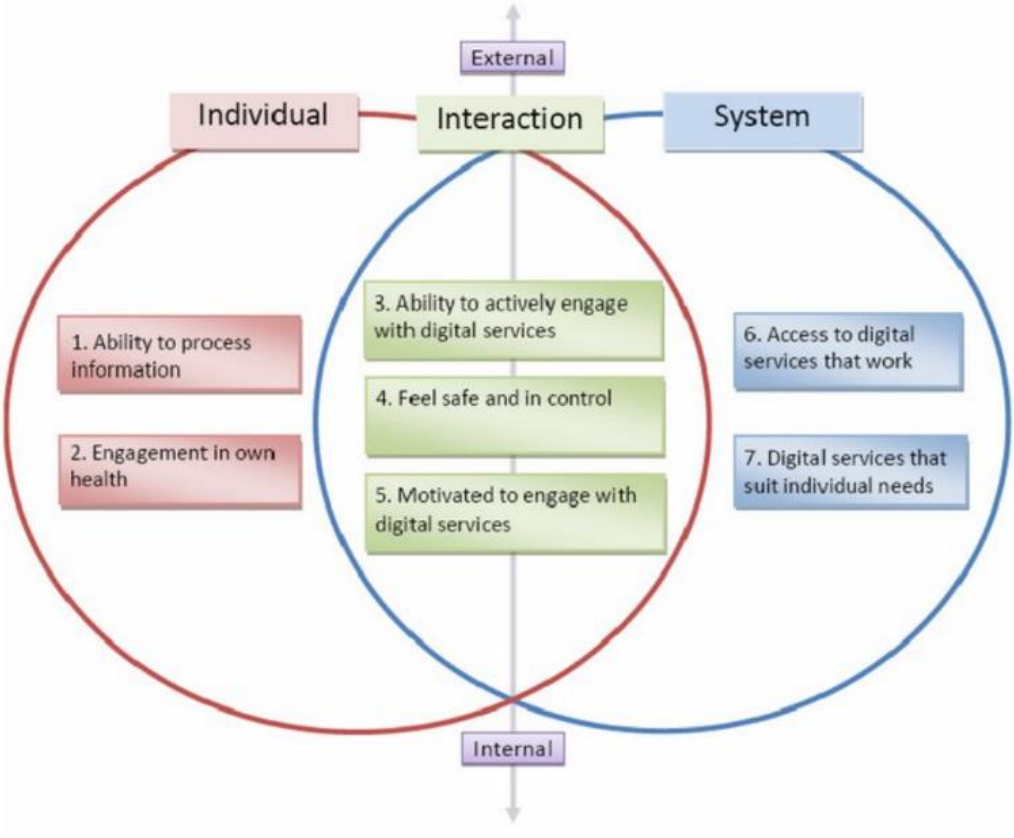

Figure 2: The E-Health literacy Framework (ELF, 2015)

Aim of my study

My innovative approach in this Veni project is that I will discover how interactions between factors derived from single factor models (figure 1,2) are related to E-Health. In cocreation with DIPs and healthcare professionals I will develop strategies for different clusters of DIPs, **which is unique because DIPs are mostly not included in studies.** This is challenging, however my network and experience make this approach feasible. **The final aim is to develop a decision support method** for healthcare professionals that will enable DIPs to benefit from E-Health.

2a2. Research plan

I include **Chronic Obstructive Pulmonary Disease (COPD) patients,** a common chronic condition (22). There are many E-Health applications available for this group (23), but E-Health user rates are low due to the high proportion of DIPs, which makes this an **excellent case group** for this study. COPD patients are on average older (67±11 years (24)) and have a low education level (25). I want to perform my study in the **Netherlands, Germany and in the UK** to compare cultural aspects of E-Health and to improve the generalizability of my findings.

WP1: How are contextual and communicational factors related to E-Health usage in DIPs?

Opinions and needs regarding conceptual and communicative experiences (20) will be discussed with COPD patients in focus groups (Netherlands, UK and Germany, table 3). Qualitative research aims to collect experiences, attitudes and opinions (26) and data collection stops if saturation is reached: a power calculation is not applicable (27). I expect to reach saturation with 2 focus groups in each country. I will hire an assistant in the UK and Germany.
WP1 will lead to an overview of contextual and communication experience factors for DIPs.

Table 3: Concepts used in the focus groups of WP1

Topics of the focus groups	Source
Experiences with technology and E-Health	Background information
Type of health question	E-Health Literacy Model (ELM, 2014)(20)
Type of E-Health technology	
Cultural, social, institutional context	
Propositional literacy	
Procedural literacy	
Communicative experience	

WP2: Is there a difference between DIPs who use E-Health and DIPs not using E-Health?

Based on the results of the WP1 a survey is developed and added to the E-Health Literacy Framework concepts (eHLQ, table 4) to collect **factors related to E-Health use**. Based on other paper survey studies in COPD the expected response rate is 50% (28,29). At least 250 respondents are needed (see WP3). I expect that 75% of the respondents is a DIP (table 1) and only these will be included in this study. Therefore, the paper survey will be sent to 333 COPD patients in each country (n=1000 total).
WP2 will lead to a large dataset with factors that are related to E-Health use in DIPs.

Table 4: Survey topics

** = used as proxy to determine where the respondent is a DIP*

*** = output variable for the decision tree (WP3)*

Topics	Source
Barriers and facilitators of patients from WP1	Outcomes from focus groups WP1
Demographic information	Background information
Ability to process information*	E-Health Literacy Questionnaire (eHLQ) (19)
Engagement in own health	
Ability to engage actively with digital services*	
Feeling safe and in control	
Motivation to engage with digital services	
Having access to systems that work	
Digital services that suit individual needs	
E-Health experience**	The use of E-Health provided by healthcare organization/ provider (e.g. patient web portal, video consultation, telemonitoring)

WP3a: How do interactions between factors from WP2 predict the likelihood of E-Health use in DIPs?
WP3b: Which clusters can be distinguished based on the different pathways in the decision tree?
Data from WP2 will be used **to develop a tree that will predict the likelihood of a DIP to use E-Health**. I will use the Classification and regression trees (CART) technique, comparable with the technique I used previously (30). CART datasets need between 250-500 cases (31), I aim at including 375 patients.
The tree provides a visual overview of (previously unknown) interactions between factors. Above that, it shows different clusters of DIPs (Figure 4).

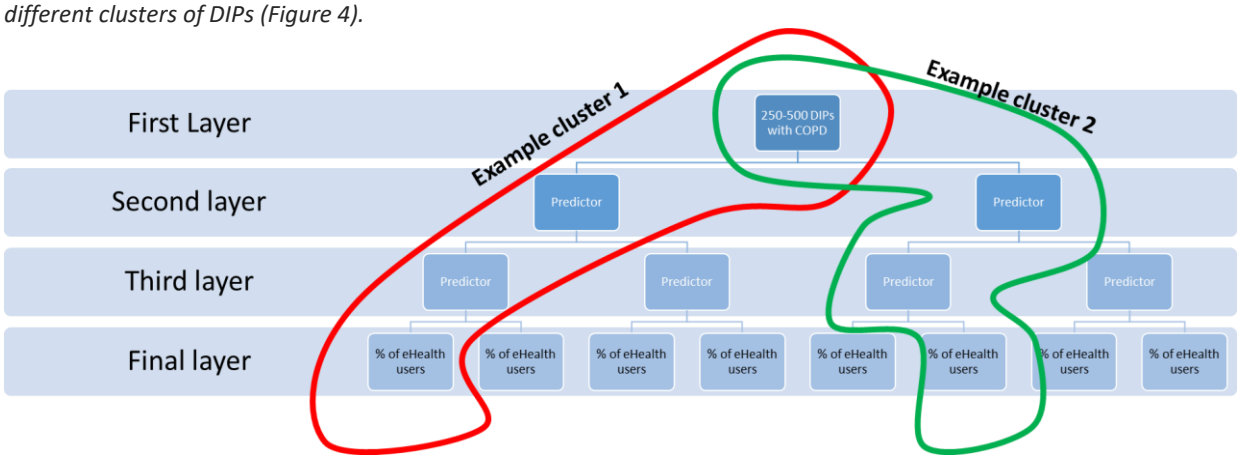

Figure 4: Simplified example of a decision tree and the establishment of the clusters. Mayer means deepening of the decision tree.

WP4 What are, according to DIPs and healthcare professionals, feasible and effective strategies to make E-Health accessible for each cluster?
In **cocreation with DIPs and healthcare professionals** (Netherlands, Germany and UK), I will develop strategies for each cluster to overcome barriers. I will perform interviews with COPD patients (30 E-Health users and 30 non-users) and 6 focus groups with COPD healthcare professionals. I will hire an assistant in Germany and in the UK.
I will spend 3 months in Germany and in the UK.
This leads to a clear and concise overview of strategies per cluster that can be used by healthcare organisation to engage DIPs in E-Health.

WP5 Are the strategies developed in WP4 feasible to use and to implement in healthcare?
Healthcare professionals (Dutch hospital) will **test the decision support method to engage digital illiterate COPD patients in their E-Health program** (32). I will evaluate: 1) proportion of DIPs that start using E-Health (<2 months), and 2) satisfaction of professionals with this procedure.
This part of the study will provide first insights in the feasibility and effectiveness of the decision support tool.

Feasibility
For my planning, see figure 5. **My network will support me during this study**: I am member of the International Primary Care Respiratory Group (IPCRG), the Technology Respiratory Effectiveness Group, the mHealth/eHealth group of the European Respiratory Society, the Groningen Research Institute for Asthma and COPD (GRIAC) and I regularly work together with the European Lung Foundation. Via the IPCRG and the Dutch lung foundation I can access international COPD patient panels.

I have permission from Prof.Dr. Hilary Pinncock (**University of Edinburgh)** and Prof.Dr. Felix Balzer (**University Medical Centre Charité in Berlin)** to perform part of my project in their institutes. I plan to follow a German language course. The costs for this international part will be covered by grants that I have previously obtained.

The E-Health Literacy Questionnaire is available in Dutch, English and German **and I arranged a licence to use the questionnaire.**

Confirmed collaboration partners
University of Groningen, Aletta School of Public Health, University Medical Center Groningen, University of Edinburgh, Charité Berlin, the International Primary Care Respiratory Group, National E-Health living lab (NELL), Vliegwielcoalitie (Dutch organisation that supports healthcare organisations in the implementation of E-Health), GRIAC, the Dutch Lung foundation, the Dutch patient Federation and CuraVista (IT company from the E-Health program in WP5).

2a3. Motivation for choice of host institute

The University Medical Center Groningen (UMCG) department of health psychology is active in national and international E-Health research. The UMCG is a high technological and innovative knowledge organisation. One of the main priorities of the hospital is to achieve sustainable healthcare by digitalisation and data-driven care. This is an excellent breeding ground for E-Health research. This perfectly matches my Veni project. I already work with many UMCG researchers.

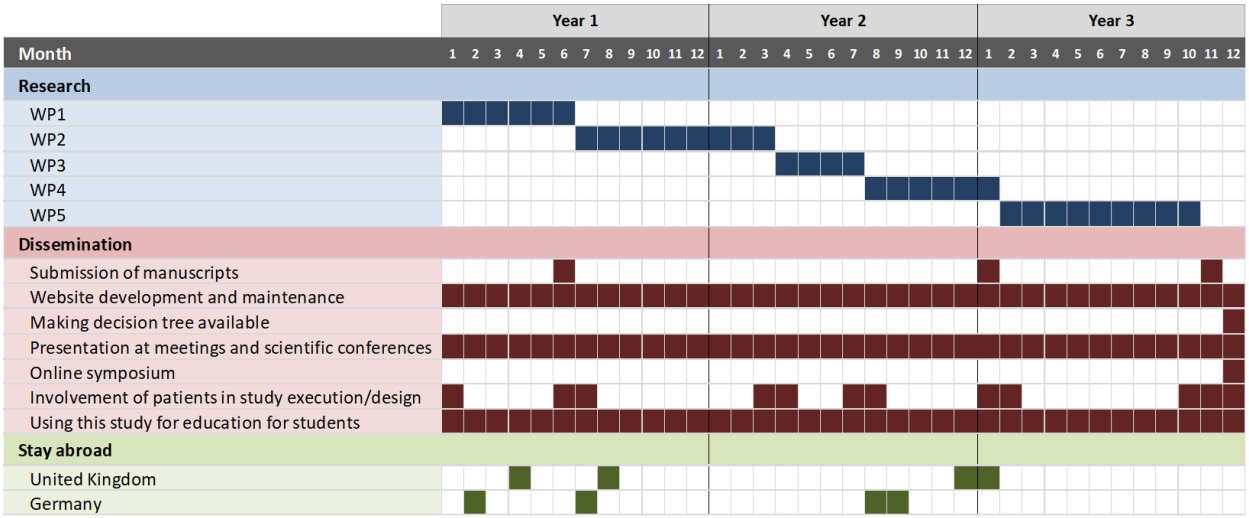

Figure 5: Time schedule

Wordcount 2000

2b. Knowledge utilisation (weight 20%)

☒ Yes, this proposal has the potential of knowledge utilization
☐ No, this proposal has no direct knowledge utilization

See figure 6 for an overview of knowledge users. Some results (awareness, use of the decision support tool for COPD) have **direct impact**. Other results need further research but will have impact **within 3 years**. My network and partnerships will support me in reaching the knowledge users.

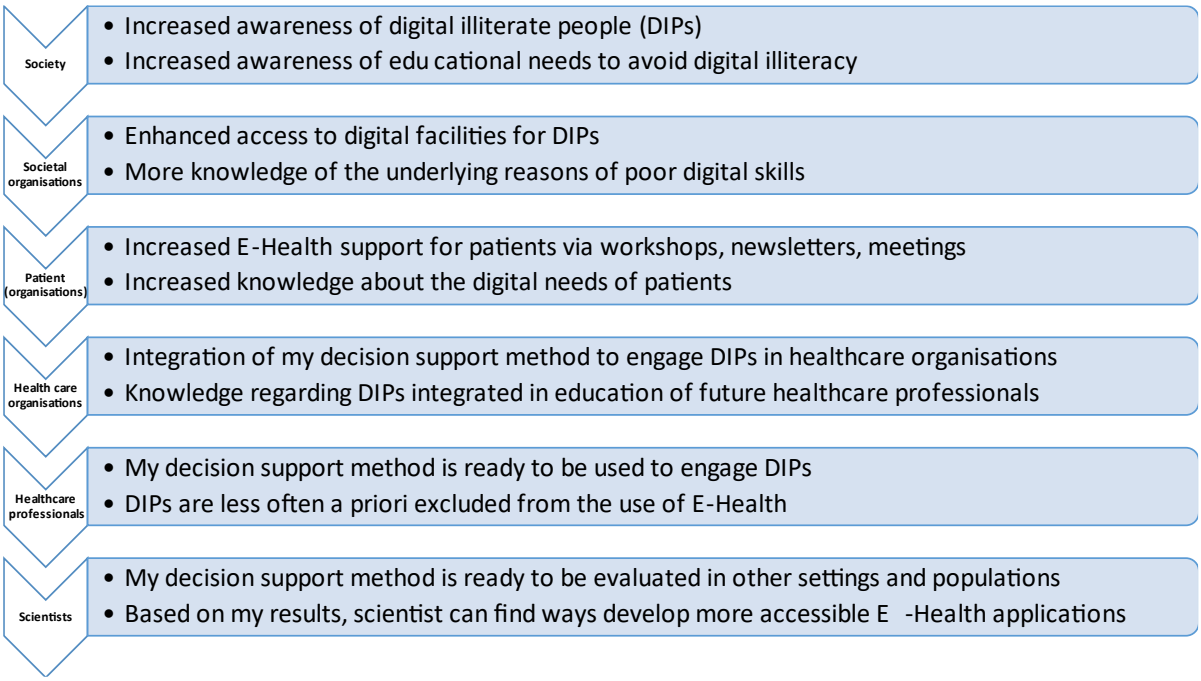

Figure 6: Overview of impact for knowledge users

Potential

DIPs have reduced access to social facilities because the preferred way of applying for facilities is through the internet. Organisations can use my decision support method to support DIPs, future studies should evaluate my **decision support method in other populations, other countries and in non-medical settings**.

My method will become available directly after the study and will raise awareness in healthcare professionals about the importance to engage DIPs in E-health. DIPs should not be excluded from E-Health a priori: with tailored support E-Health might be feasible even for DIPs. Awareness needs to be **secured in healthcare professional education. Therefore, I will use this study as example in my lectures and tutorials for healthcare students and professionals**.

The prevalence of Digital illiterate people (DIPs) in under 55 years old is high (±50%, table 1). An important part of society cannot keep up with the increasing digitalisation which has important health and societal consequences. My study gives insight into underlying reasons for digital illiteracy which can be **used in educational programs for young people** to reduce the future proportion of DIPs.

The international part of my project at the University of Edinburg and at the University Medical Center Charité in Berlin will lead to **long term research collaboration** between them and my host institute in the field of E-Health literacy.

Implementation

The Dutch Lung Foundation, the Dutch Patient Federation and the patient panel from the Groningen Research Institute of Asthma and COPD (GRIAC) will advise me in the design and execution of this study. I will raise awareness for DIPs and propose solutions based on the decision support tool via **meetings, presentations and workshops at patient-gatherings and in newsletters for patients**.

I will **submit 3 manuscripts derived from this study,** of which two for international scientific E-Health journals (WP1 and WP3) one to a Dutch journal for healthcare professionals (WP5). I will present the (preliminary) results of at **national and international conferences** (e.g. Supporting Health by Technology Groningen/Enschede, International Conference on E-Health Technologies and Standards, European Respiratory Society Conference (ERS), International Primary Care Respiratory Group, International Conference on Digital Health and Wellness, International Conference on Digital Healthcare and Research).

This study is also of interest for **organisational and technical sciences**. Organisational scientists are experts in evidence based implementation of innovations and know how to integrate this tool in healthcare. Moreover, technical scientists can improve current E-Health technology and propose new innovative development, design or device options.

I will develop a website in Dutch, English and German in the first year. Awareness for the website will be raised via social media and via my network. The site will contain study information, scientific output, presentations and **the decision support method as downloadable PDF and as interactive tool**. Users of the decision support method will be asked for feedback via an online questionnaire so that the method can be optimized after the study. I have built several websites (33) and I have worked as website manager for a charity organisation.

I will organize an **interactive and exciting symposium for scientist and healthcare professionals.** Also, DIPs who have participated in the study will be invited to share their experiences with digitalisation to raise awareness. Over the past years I have lectured online and organized several conferences among which the IRW conference with 200 international delegates, patient involvement, a panel discussion and many breakout workshops (34).

Word count 700

2c. Literature references

References

1. Communication on enabling the digital transformation of health and care in the Digital Single Market; empowering citizens and building a healthier society | Shaping Europe's digital future [Internet]. [cited 2021 May 7]. Available from: https://digital-strategy.ec.europa.eu/en/library/communication-enabling-digital-transformation-health-and-care-digital-single-market-empowering
2. Sanders CK, Scanlon E. The Digital Divide Is a Human Rights Issue: Advancing Social Inclusion Through Social Work Advocacy. Journal of human rights and social work. 2021 Mar;1–14.
3. RJ J, JQ L, RL O, Caballero J, Jacobs RJ, Lou JQ, et al. A systematic review of eHealth interventions to improve health literacy. Health informatics journal TA - TT -. 2016 Jun;22(2):81–98.
4. (WHO) WHO. Atlas of eHealth country profiles: the use of eHealth in support of universal ehealth coverage. Vol. W 26.5. 2016.
5. Martins Van Jaarsveld G. The Effects of COVID-19 Among the Elderly Population: A Case for Closing the Digital Divide. Frontiers in psychiatry. 2020;11:577427.
6. Hassell LA, Peterson J, Pantanowitz L. Pushed Across the Digital Divide: COVID-19 Accelerated Pathology Training onto a New Digital Learning Curve. Academic pathology. 2021;8:2374289521994240.
7. Eberly LA, Khatana SAM, Nathan AS, Snider C, Julien HM, Deleener ME, et al. Telemedicine Outpatient Cardiovascular Care During the COVID-19 Pandemic: Bridging or Opening the Digital Divide? Vol. 142, Circulation. United States; 2020. p. 510–2.
8. Lai J, Widmar NO. Revisiting the Digital Divide in the COVID-19 Era. Applied economic perspectives and policy. 2020 Oct;
9. Buchholz BA, DeHart J, Moorman G. Digital Citizenship During a Global Pandemic: Moving Beyond Digital Literacy. Journal of adolescent & adult literacy : a journal from the International Reading Association. 2020;64(1):11–7.
10. Declaration of Alma Ata. The Alabama Journal of Medical Sciences. 1983 Apr;20(2):152–3.
11. Monkman H, Kushniruk AW, Barnett J, Borycki EM, Greiner LE, Sheets D. Are Health Literacy and eHealth Literacy the Same or Different? Studies in health technology and informatics. 2017;245:178–82.
12. Davies JM, Sleeman KE, Leniz J, Wilson R, Higginson IJ, Verne J, et al. Socioeconomic position and use of healthcare in the last year of life: A systematic review and meta-analysis. PLoS medicine [Internet]. 2019 Apr 23;16(4):e1002782–e1002782. Available from: https://pubmed.ncbi.nlm.nih.gov/31013279
13. Eurostat - internet activities [Internet]. 2019 [cited 2020 Nov 19]. Available from: https://appsso.eurostat.ec.europa.eu/nui
14. Parker S, Prince A, Thomas L, Song H, Milosevic D, Harris MF. Electronic, mobile and telehealth tools for vulnerable patients with chronic disease: a systematic review and realist synthesis. BMJ open. 2018 Aug;8(8):e019192.
15. Watkins I, Xie B. eHealth literacy interventions for older adults: a systematic review of the literature. Journal of medical Internet research [Internet]. 2014 Nov 10;16(11):e225–e225. Available from: https://pubmed.ncbi.nlm.nih.gov/25386719
16. Metting EI, Verhallen L, de Jong C. Barriers and facilitators of developing and implementing eHealth applications: a questionnaire study with eHealth professionals. European Respiratory Journal [Internet]. 2019 Sep 28;54(suppl 63):PA2239. Available from: http://erj.ersjournals.com/content/54/suppl_63/PA2239.abstract
17. Metting E, Schrage AJ, Kocks JW, Sanderman R, van der Molen T. Assessing the Needs and Perspectives of Patients With Asthma and Chronic Obstructive Pulmonary Disease on Patient Web Portals: Focus Group Study. JMIR formative research. 2018 Nov;2(2):e22.
18. Metting EI, Baron A-J, Chavannes NH, Tran A, van Luenen S, de Jong C. Evaluation of a pharmacy based personal health record by elderly respiratory patients. European Respiratory Journal [Internet]. 2019 Sep 28;54(suppl 63):PA748. Available from: http://erj.ersjournals.com/content/54/suppl_63/PA748.abstract
19. Kayser L, Karnoe A, Furstrand D, Batterham R, Christensen KB, Elsworth G, et al. A Multidimensional Tool Based on the eHealth Literacy Framework: Development and Initial Validity Testing of the eHealth Literacy Questionnaire (eHLQ). Journal of medical Internet research. 2018 Feb;20(2):e36.
20. Gilstad H. Toward a Comprehensive Model of eHealth Literacy. In: PAHI. 2014.
21. Norman CD, Skinner HA. eHealth Literacy: Essential Skills for Consumer Health in a Networked World. J Med Internet Res [Internet]. 2006;8(2):e9. Available from: http://www.jmir.org/2006/2/e9/
22. WHO | Burden of COPD [Internet]. [cited 2020 Oct 20]. Available from: https://www.who.int/respiratory/copd/burden/en/
23. Hallensleben C, van Luenen S, Rolink E, Ossebaard HC, Chavannes NH. eHealth for people with COPD in the Netherlands: a scoping review. International journal of chronic obstructive pulmonary disease. 2019;14:1681–90.
24. Metting EI, Riemersma RA, Kocks JH, Piersma-Wichers MG, Sanderman R, van der Molen T. Feasibility and effectiveness of an Asthma/COPD service for primary care: A cross-sectional baseline description and longitudinal results. npj Primary Care Respiratory Medicine. 2015;25.
25. Sahni S, Talwar A, Khanijo S, Talwar A. Socioeconomic status and its relationship to chronic respiratory disease. Advances in respiratory medicine. 2017;85(2):97–108.
26. Pathak V, Jena B, Kalra S. Qualitative research. Perspectives in clinical research [Internet]. 2013 Jul;4(3):192. Available from: https://pubmed.ncbi.nlm.nih.gov/24010063
27. Saunders B, Sim J, Kingstone T, Baker S, Waterfield J, Bartlam B, et al. Saturation in qualitative research: exploring its conceptualization and operationalization. Quality & quantity [Internet]. 2017/09/14. 2018;52(4):1893–907. Available from: https://pubmed.ncbi.nlm.nih.gov/29937585
28. National COPD Audit Programme: Patient Reported Experience Measures (PREMs) Development Work & Feasibility Report [Internet]. 2014. Available from: file:///Users/esthermetting/Downloads/copd_prem_development_work_feasibility_report_final_web_version_aug_2015_0 (1).pdf

29. VanderSchaaf K, Olson KL, Billups S, Hartsfield CL, Rice M. Self-reported inhaler use in patients with chronic obstructive pulmonary disease. Respiratory Medicine [Internet]. 2010;104(1):99–106. Available from: https://www.sciencedirect.com/science/article/pii/S095461110900225X
30. Metting EI, In 'T Veen JCCM, Richard Dekhuijzen PN, van Heijst E, Kocks JWH, Muilwijk-Kroes JB, et al. Development of a diagnostic decision tree for obstructive pulmonary diseases based on real-life data. ERJ Open Research. 2016;2(1):1.
31. Venkatasubramaniam A, Wolfson J, Mitchell N, Barnes T, JaKa M, French S. Decision trees in epidemiological research. Emerging Themes in Epidemiology. 2017;14(1):11.
32. van Noort EMJ, Claessens D, Moor CC, Berg CAL van den, Kasteleyn MJ, in 't Veen JCCM, et al. Online Tool for the Assessment of the Burden of COVID-19 in Patients: Development Study. JMIR formative research. 2021 Mar;5(3):e22603.
33. www.irwstudy.com – Improving inhaler technique in asthma and COPD patients by combining the knowledge and experience of patients, scientists and health care professionals [Internet]. [cited 2021 May 8]. Available from: https://www.irwstudy.com/
34. The IRW conference was a great success! – www.irwstudy.com [Internet]. [cited 2021 May 4]. Available from: https://www.irwstudy.com/2018/07/31/the-irw-conference-was-a-great-succes/

2d. Data management section

1. Will this project involve re-using existing research data?
   - ☐ Yes: Are there any constraints on its re-use?
   - ☒ No: Have you considered re-using existing data but discarded the possibility? Why?

     Yes I have considered this but there is no data available to answer my research questions.

2. Will data be collected or generated that are suitable for reuse?
   - ☒ Yes: Please answer questions 3 and 4.
   - ☐ No: Please explain why the research will not result in reusable data or in data that cannot be stored or data that for other reasons are not relevant for reuse.

3. After the project has been completed, how will the data be stored for the long-term and made available for the use by third parties? Are there possible restrictions to data sharing or embargo reasons? Please state these here.

   After the project the data will be stored in Redcap according to the UMCG policies and the FAIR principles. I will manage the data in alignment with the data steward from the Digital Competence Center of the UMCG. Other researchers who want to use my data can sent a data request with a research plan to the main researcher after the project. The heads of the Health Psychology department of the UMCG decide if the data can be provided. This depends on the research pan, whether the researchers provide a solid data storage plan and whether they can obtain ethical approval. Data will be shared via a virtual workspace of UMCG.

4. Will any costs (financial and time) related to data management and sharing/preservation be incurred?
   - ☐ Yes: Then please be sure to specify the associated expenses in the budget table of this proposal.
   - ☒ No: All the necessary resources (financial and time) to store and prepare data for sharing/preservation are or will be available at no extra cost.

3. Curriculum Vitae (weight: 40%)

3a.Academic profile

This Grant will enable me to develop a decision support method for professionals to engage DIPs in E-Health, and it **will be a springboard for me to start my own research group on E-Health literacy**.

My social background, work experience and education give me a unique and generalistic view on E-Health. I have obtained two master degrees (**psychology and epidemiology**) and finalized my PhD in five years. During my PhD I was shortly referred to a rheumatic care unit where I had conversations with DIPs. They explained to me that healthcare organizations implement E-Health without taking into account their needs, or just accept that they cannot be engaged. I have noticed that there is a discrepancy between **expected** digital capabilities by professionals and the **actual** digital skills of citizens.

My position led to an unique viewing point that has definitely improved my E-Health research because I can relate easily with DIPs. **My projects have impact**: the diagnostic decision tree is used by primary care physicians all over the world to improve diagnosis (first author, k.o.5), I was involved in the development of guidelines to improve inhaler medication use (k.o.7), the Asthma/COPD-service expanded based on my findings (first author, k.o.2), I have **increased awareness** for comorbidities in COPD (k.o.9) and the social impact of asthma/COPD and personalized care (first author, k.o.8), a large pharmacy based patient web portal was adapted according to my study results (first author k.o.4). My study regarding CoronaMelder (k.o.6) influenced the political advice of the **House of Representatives and the decisions of the Dutch minister of Health**.

I have combined an E-Health management function at Certe (primary care laboratory) with a postdoc position (2018-2019), which lead to **relevant organisational experiences regarding E-Health**. At the Faculty of Economics and Business I learned how operations management, change management and implementation sciences can benefit E-Health research. Recently I got appointed as member of the Young Academy Groningen (YAG), which is a **highly selective club of talented junior researchers** from the University of Groningen. The aim of the YAG is to connect society with academia, give a voice to early career researchers, stimulate dialogue between disciplines within and outside of academia and to promote the development of early career researchers.

I am working on “CoronaMelder (COVID tracing app)” and “CoronaCheck (proof of not-infectiousness app used to get access to events)” on behalf of the Ministry of Health (k.o.6). This led to my **expert position for the European Centre for Disease Prevention and Control**. The Minister of Health requested me to advise the “Gezondheidsraad (Dutch Health Council)” regarding of E-Health applications.

I am ZonMW Citrien-E-Health 1&2 project leader (large E-Health project in all Dutch University Medical Centers, k.o. 4) where I implement existing E-Health tools. With students I have performed interviews in the cross-border region Groningen-Niedersachsen regarding cross-border healthcare use and E-Health in DIPs (Interreg Grant). We recently received a ZonMW Grant to start implementing a self-management app for incontinence.

As member of the UMCG E-Health stakeholder group, the Respiratory Effectiveness Technology Group, and project leader in the EU H2020 Connecare E-Health consortium I have advocated the importance of DIPs involvement. **As board member** of the Rheumatology patient organisation Groningen I have organized an E-Health workshop to let patients try-out E-Health applications. I am steering group member and primary investigator of the COVID-19 fast testing lane for higher and moderate educational organisations in Groningen.

I received a **bonus for excellent work** by the board of directors UMCG in 2018 and received several prizes (best abstract IPCRG Porto 2018 and ERS London 2016, top publication SHARE 2015, most relevant study Longfonds 2013) for patient centered research.

I have **8 years teaching experience** and I am one of the lecturers in the UG program “Strategic Leadership for Medical Specialists.” I developed a multidisciplinary E-Health course, and was invited lecturer in Romania, Bangladesh, UK, China and Malaysia.

In various **international, national and regional media**, including news papers and television, I raised awareness for DIPs and for people with low social economic status during the pandemic. On radio (e.g. Radio 1, Omrop Fryslân, RTV-Noord, Omroep Drenthe), television (e.g. WNL Goedemorgen Nederland, Nieuwsuur) and in newspapers (e.g. Financieël Dagblad, Trouw, Dagblad van het Noorden, De Tijd).

Word count: 699

3b. Key output

*1. **Metting**, Schrage, Sanderman, van der Molen, Kocks. Assessing the Needs and Perspectives of Patients With Asthma and Chronic Obstructive Pulmonary Disease on Patient Web Portals: Focus Group Study. (2018). JMIR Form Res. 2018 Jul-Dec; 2(2): e22. DOI: 10.2196/formative.8822 "O"*
In this focus group study, with nine groups explicitely including DIPs, we showed that **DIPs are not necessarily unwilling to use technology**, but they simply don't know where to start. **The social environment** should be more involved. DIPs were explicitly included in this study. I decided to drive some patients without transportation means to the meetings to reduce barriers for participation which makes this study **unique**.

*2. **Metting**, Riemersma, Kocks, Piersma-Wichers, Sanderman and Molen. Feasibility and effectiveness of an Asthma/COPD service for primary care: a cross-sectional baseline description and longitudinal results. NPJ Prim Care Respir Med. 2015 Jan 8;25:14101. Doi: 10.1038/npjpcrm.2014.101 "O"*
This integrated care service was **best practice in the "EU- Advancing Care Coordination and TelE-Health Deployment project"** and was rewarded by the Dutch lung Foundation for **"most relevant scientific study"**. Patients are assessed in a laboratory close to home and data is sent online to pulmonologists. They send their advice to the GP. Over 20,000 patients have been assessed in this way. This project was the basis of E-health projects that I have launched as project leader in this laboratory for the Asthma/COPD-service.

*3. **Metting.** Eind evaluatie NFU E-Health project digitale verbondenheid "Look and feel." (2018) "O"*
DIPs have specific needs that need to be taken into account when engaging them in personalized health records. The provision of sound information is most important, and navigation needs to be easy. **This relevant project described experiences with involvement of DIPs and IT specialists in developing and implementing E-Health**. The output of the study are available for Dutch E-Health professionals.

*4. **Metting**, Baron, Chavannes, Tran, van Luenen, & De Jong. Evaluation of a pharmacy based personal health record by elderly respiratory patients. European Respiratory Journal 2019 54: PA748; DOI: 10.1183/13993003.congress-2019.PA748 "O"*
The uniqueness of this study is that patients first practiced with the website before the focus group discussions. Patients, predominantly DIPs, were enthusiastic about the information but **had difficulties with logging in and with navigating through the website**. Elderly asthma and COPD patients has specific needs regarding the layout and navigation.

*5. **Metting,** In 't Veen, Dekhuijzen, van Heijst, Kocks, Muilwijk-Kroes, van der Molen. Development of a diagnostic decision tree for obstructive pulmonary diseases based on real-life data. ERJ Open Res. 2016 Jan 22;2(1). Doi: 10.1183/23120541.00077-2015 "O"*
Healthcare data from the asthma/COPD-service (k.o.2) were used to develop a diagnostic decision tree and was **distributed among physicians by the International Primary Care Group for the use in clinical practice**. The uniqueness of this study is that real-life data were used (including data from patients with comorbidities, low social economic status etc.). The output is therefore **highly generalizable.** The variety in diagnostic patterns shows the relevance **for personalized disease management**. A very comparable statistical method will be used in my Veni.

*6. Ebbers, van der Laan, Hooft, **Metting.** Evaluatieprotocol Effectiviteit CoronaMelder in opdracht van Ministerie van VWS. Bijlage kamerbrief voortgang CoronaMelder (2020) "O"*
Our protocol was discussed in and approved by the **Dutch House of Representatives and the Senate.** We develop monthly reports of CoronaMelder based on the evaluation of behaviour, epidemiology, technology, policy and healthcare processes. **The integration by DIPs is part of this will be evaluated via paper questionnaires.** I contribute in this team as behavioural and epidemiological E-Health expert.

7. Long Alliantie Nederland (LAN). Zorgpad inhalatiemedicatie (2019). Report on website LAN. "O"
I was part of the expert advisory board that developed this report for healthcare professionals. As chair of the Inhaler Research Workgroup foundation (IRW) I have developed an online **E-Health IRW training program** for patients and professionals. This program is based on needs and perspectives of patients gathered in interviews with **140 patients in 3 European countries** by the IRW. **In this report the IRW method is advised as the preferred method to instruct patients**.

*8. **Metting**, Kocks, & Schrage. Sociale problemen bij astma en COPD. TPO De praktijk. 2017, December.*
Loneliness, lack of social support and avoidance of social contacts (with pets or smokers) can have an important impact on the quality of life. Especially **DIPs had difficulties to communicate effectively** with their social environment which increased social difficulties. We discussed in this publication for primary care nurses

whether E-Health could bring some support. Patients indicated that **online information specifically for family members, friends or colleagues can be beneficial.**

*9. Westerik, **Metting**, van Boven, Tiersma, Kocks, & Schermer. Associations between chronic comorbidity and exacerbation risk in primary care patients with COPD. Respiratory Research (2017) 18:31. DOI 10.1186/s12931-017-0512-2 "O"*
This was an important study with use of **electronical primary routine care databases**. Comorbidities appeared to be common and were related with increased exacerbation risk. This patient group requires a personalized approach to address the different phenotypes. **Standardisation in electronic databases is important to apply big data analysis like the CART analysis I will perform in my Veni.** This can improve tailored decision support systems that take into account personal characteristics of patients. I was responsible for the data preparation, analysis and review of the text.

*10. Morning and night symptoms in primary care COPD patients: a cross-sectional and longitudinal study. An UNLOCK study from the IPCRG. Tsiligianni, **Metting**, van der Molen, Chavannes, & Kocks (2016). npj Primary Care Respiratory Medicine volume 26: 16040 (2016). DOI: 10.1038/npjpcrm.2016.40 "O"*
This is the **first study that showed the prevalence of morning and night symptoms** in COPD patients. Analysis was based on data from the asthma/COPD-service (k.o. 2). This publication shows the relevance of **E-Health services** in getting more insight in previously unknown symptoms **so that treatment and management can become more personalized.** I was responsible for the data preparation, analysis and review of the text.

Word count: 696

4. Administrative details

4a. Master's degree ('doctoraal')

University/College of Higher Education:	University of Groningen
Main subject:	Master Psychology
University/College of Higher Education:	University of Groningen
Main subject:	Research master Clinical and Psychosocial epidemiology

4b. Doctorate

University/College of Higher Education:	University of Groningen
Starting date (dd/mm/yy):	15-9-2012
Date of PhD award (dd/mm/yy):	Defence date 4-6-2017 (thesis approved December 2016)
Supervisor(s) ('Promotor(es)'):	Prof. Dr. Thys van der Molen and Prof. Dr. Robbert Sanderman
Thesis title:	Development of patient-centered management of asthma and COPD in primary care

4c. Work experience since completing your (first) PhD

List your appointments chronologically. The bottom row should contain your current position.

Position	Period (date-date)	FTE	Position type (fixed term/permanent/ tenure-track/other)	Institution
Post doc position	01/09/2017-01/01/2020	0.5	Fixed term	University Medical Center Groningen
Website management	01/09/2017-01/02/2019	0.1	Other	International Primary Respiratory Group (UK)
Lecturer	11/02/2019-21/04/2019	0.2	Other	Hanze University of Applied Sciences
Board member	01/06/2019-current	0.05	Other	Reumapatiëntenvereniging Groningen
Project manager E-Health	01/10/2018-01/10/2019	0.5	Other	Certe Primary Care Laboratory
Chair	15/5/2019-current	0.05	Other	Inhaler Research Workgroup Foundation
Editor in chief	01/09/2019-current	0.05	Other	Nederlands huisartsengenootschap, COPD Astma Huisartsenadviesgroep (NHG-CAHAG)
Assistant professor	01/10/2019-current	1.0	Other	University of Groningen

4d. Months spent since completing your (first) PhD (include a calculation)

Please include a calculation, see the explanatory notes for an example of such a calculation.

Experience	Number of months
Research activities	(26 + 33 + 9 =) 70
Education	(7 + 11 + 4 =) 22
Leave	(6 + 4 =) 10
Management tasks	(1+1+11 + 4 =) 17
Others (please specify):	Editorial work =1 Website manager =2

If applicable: You may mention special circumstances (e.g. due to COVID-19) that account for a reduction in productivity (max. 100 words).: