An empirically derived taxonomy of telemedicine – development of a standardized codebook

Lorenz Harst M.A.
Forschungsverbund Public Health / Zentrum für Evidenzbasierte Gesundheitsversorgung

Autoren

Lorenz Harst[1], Lena Otto[2], Patrick Timpel[3], Peggy Richter[2], Hendrikje Lantzsch[4], Bastian Wollschlaeger[5], Katja Winkler[2], Hannes Schlieter[2]

1 = Forschungsverbund Public Health Sachsen, Zentrum für Evidenzbasierte Gesundheitsversorgung, Medizinische Fakultät Carl Gustav Carus, Technische Universität Dresden, Dresden

2 = Fakultät Wirtschaftswissenschaften, Lehrstuhl für Wirtschaftsinformatik, insb. Systementwicklung, Technische Universität Dresden, Dresden

3 = Prävention und Versorgung des Diabetes, Medizinische Klinik und Poliklinik III, Medizinische Fakultät Carl Gustav Carus am Universitätsklinikum Dresden, Technische Universität Dresden, Dresden

4 = Masterstudiengang Gesundheitswissenschaften/Public Health am Institut und Polyklinik für Arbeits- und Sozialmedizin, Medizinische Fakultät Carl Gustav Carus, Technische Universität Dresden, Dresden

5 = Fakultät Informatik, Institut für Angewandte Informatik, Professur Technische Informationssysteme, Technische Universität Dresden, Dresden

Conflicts of interest

The authors declare no conflict of interest in the development of this project

Hintergrund I: Nutzen von Taxonomien

- Taxonomien erlauben die Klassifizierung von Objekten anhand verschiedener Wesensmerkmale und übergeordnteter Dimensionen (Nickerson et al. 2013)
  - Dimensionen und ihre Merkmale ergeben somit eine Klasse von Objekten
  - Entspricht einer Genotyp – Phänotyp-Korrelation in der Biologie (Ries & Gal 2006)
- Taxonomien eignen sich für die Strukturierung von Forschungsgebieten (Usman et al. 2017, Gregor 2006)
- Strukturierung eines Forschungsfeld schafft begriffliche Klarheit (Otto et al. 2018) und hilft, Prädiktoren (unabhängige Variablen) und Outcomes (abhängige Variablen) für die Evaluation zu ermitteln (Harst et al. 2019)
- Zwei mögliche Ansätze, eine Taxonomie zu entwickeln (Nickerson et al. 2013)
  - Deduktiv: Ableitung relevanter Dimensionen und Merkmale aus Forschungsstand
  - Induktiv: Empirische Klassifikation existierender Objekte anhand ihrer Merkmale
- Keine detaillierte Beschreibung der induktiven Methode bei Nickerson et al.

Hintergrund II: Existierende Taxonomien für Telemedizin

		Methodology used						Dimensions						
Authors	Year	Content Analysis	Delphi Consensus Approach	Ilities Application Method	Literature Review	Systematic Review	Umbrella Review	Application type	Clinical field	Intended outcome	Mode of data provision	Personnel involved	Setting	Technology used
Bashshur et al.	2011				x					x				x
Baumel, Birnbaum, and Sucala	2017					x				x				
Costa et al.	2009				x						x	x		x
Edmunds et al.	2017		x							x				x
Dierks	1999				x			x						
Elasy et al.	2001					x						x	x	x
Fitch	2004			x				x		x	x	x		x
Fong, Fong, and Li	2011				x			x						x
Hung, Zhang, and Tai	2004				x			x						x
Pearce et al.	2016		x				x	x						
Poenaru and Poenaru	2013				x			x						
Tulu, Chatterjee, and Laxminarayan	2005	x			x			x	x				x	x
Vincent et al.	2007				x						x		x	
Valentijn et al.	2015	x						x		x				
Total		**2**	**2**	**1**	**8**	**2**	**1**	**8**	**1**	**5**	**3**	**3**	**3**	**8**

Eigene Darstellung

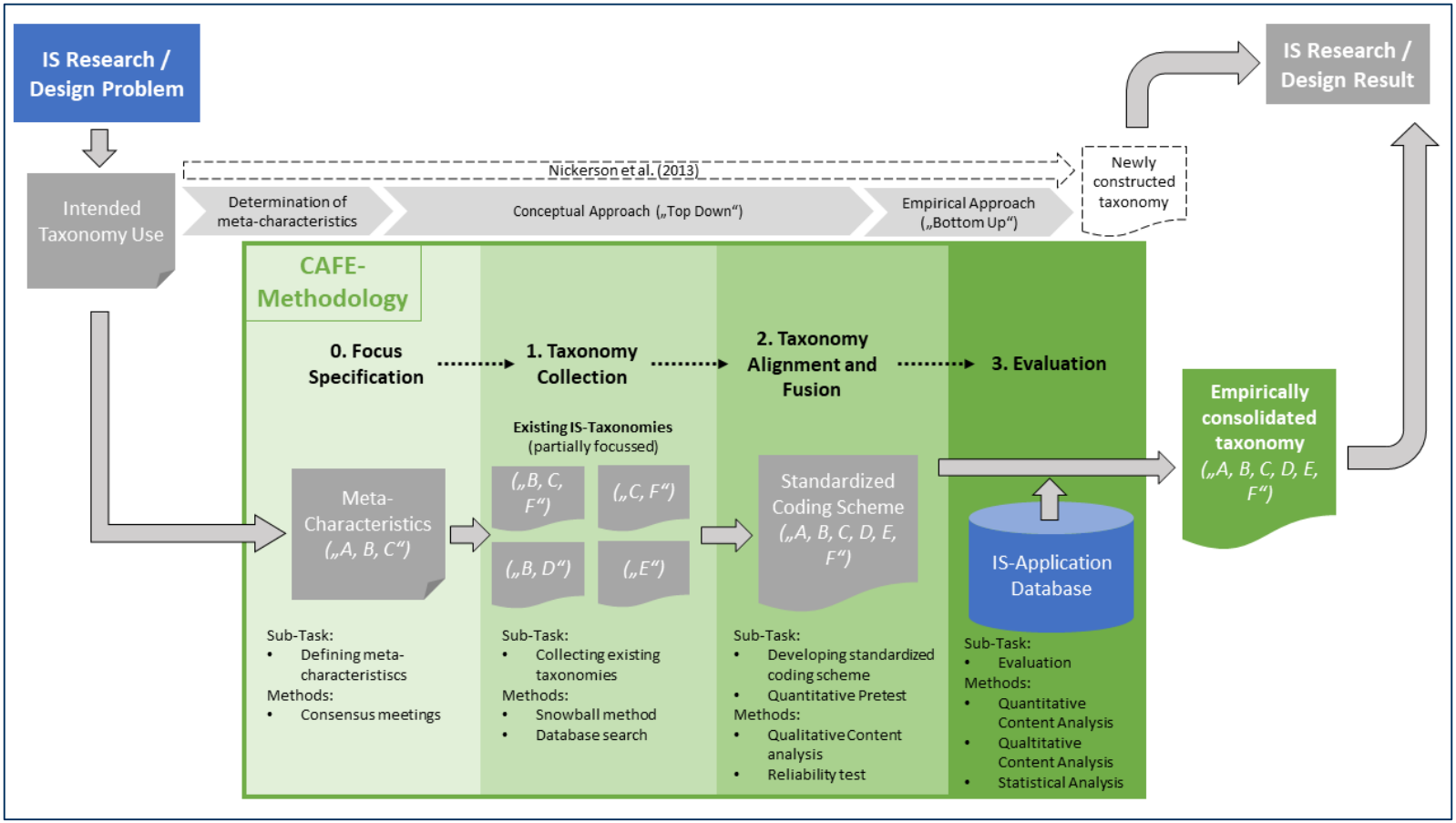
- Keine bestehende Taxonomie ist erschöpfend
- Keine beruht auf quantitativ-empirischen Verfahren
- Nur eine berücksichtigt Krankheitsbilder
- Keine berücksichtigt individuelle Patientencharakteristika
- Eine Meta-Taxonomie wäre prima

Forschungsfrage

Wie kann eine Taxonomie für Telemedizin-Anwendungen entwickelt werden, die

- *empirisch fundiert ist*
- *bestehende Taxonomien berücksichtigt*
- *präskriptiv nutzbar ist?*

Methode I: Überblick



Eigene Darstellung

Methode II:
Quantitative Inhaltsanalyse

- Verfahren aus der Sozialwissenschaft
- Validiert Strukturannahmen (qualitativ) und Muster im Datenmaterial (Krippendorff 2013) und reduziert so Informationen zu emirischen Daten (Kille et al. 2017)
- Beruht auf einem Codebuch
  - Weist Merkmalen eine Zahl zu
  - Anhand definierter Kriterien
  - Kann mithilfe von *qualitativer Inhaltsanalyse* entwickelt werden
  - Oder aus Forschungsstand abgeleitet werden
  - Beruht auf übergeordnetem Forschungsziel
- **Hier:**
  - **Forschungsziel:** Identifikation von Prädiktoren und Outcomes von Telemedizin-Anwendungen
  - **Codebuchentwicklung:** Kombination bestehende Taxonomien durch qualitative Inhaltsanalyse

Methode II:
Quantitative Inhaltsanalyse

- Anwendung des fertigen Codebuch in der GEMATIK Datenbank (heute: vesta Informationsportal)
  - Listet eHealth-Projekte
  - Selektion der Telemedizin-Projekte anhand der Defintion vom Sood et al. von 2007
  - Etwas veraltet (letztes Projekt von 2007)
- Immer zwei Coder je Projekt
- Pretest mit 10 Projekten, um Intercoderreliabilität zu ermitteln (Krippendorff's Alpha muss über 0,67 liegen)
- **<u>Statistische Analyse:</u>**
  - Genotyp-Phänotyp-Korrelationen (bivariate Statistik beruhend auf Kreuztabellen)
  - Faktorenanalye für die Identifikation diskriminanter Telemedizin-Typen

Ergebnisse I: Codebuch

Finales Codebuch (Auszug)

Dimensions (latent variables)	Characteristics (manifest variables)	Definition
Application type **for which the technology was designed**	Tele-consultation	A process during which a single patient or a number of patients receive care or advice from a health care professional from a distance (Fitch 2004)
	Tele-diagnosis	A process where a disease is determined while patient and health care professional are not in the same room (Dierks 1999)
	Tele-ambulance or -emergency (Fong, Fong, and Li 2011; Cho, Kwon, and Jeong 2015)	A process where emergency measures are taken from a distance, or ambulance personnel is guided from a distance (Fong et al. 2011)
	Tele-monitoring	The collection of vital data via ICT, where therapeutic decisions are made based on the provided data (Bashshur et al. 2014; Fitch 2004; Schulz, Stahmann, and Neumann 2015)
	Tele-rehabilitation	The use of ICT for measures helping patients with impairment to cope with the disease and restoring them to a state as close to normal as possible (Rogante et al. 2010; Last 2007)
	Digital self-management	Digital measures to support informed shared decision making and self-care behaviors, making use of a learning experience for the patient concerning health literacy and behavior, guided by a health care professional (Bartlett and Windsor 1985; Elasy et al. 2001; Fitzner and Moss 2013; Sheridan et al. 2017)

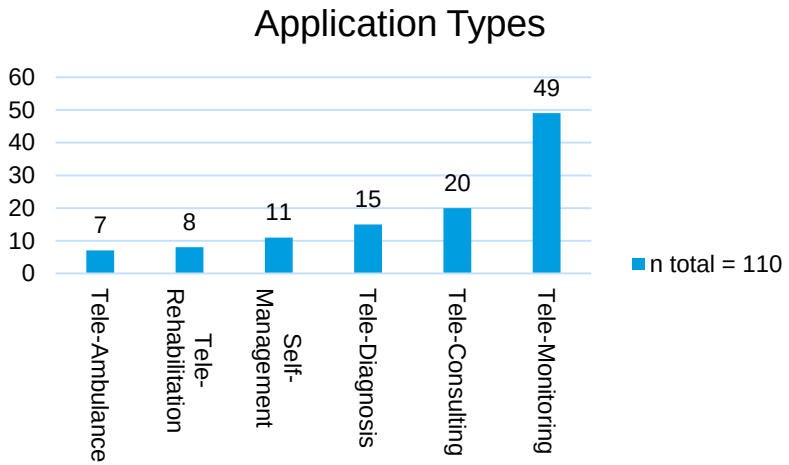
Ergebnisse II: Kodierung

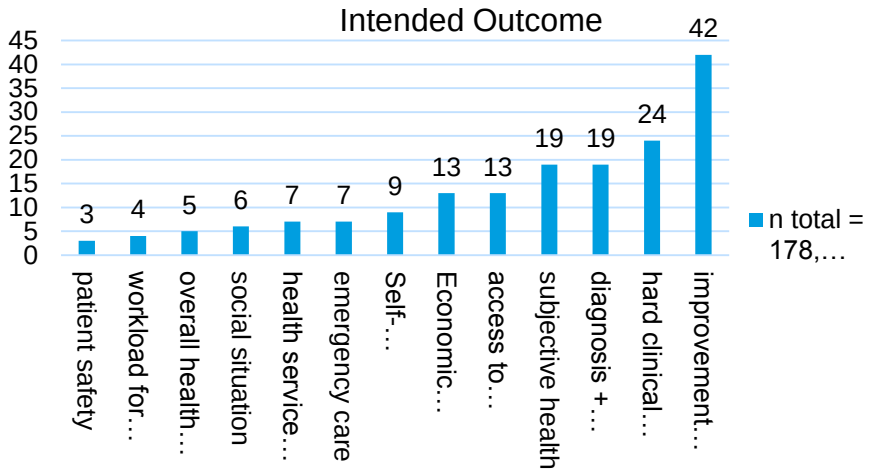
Finales Codesheet (Auszug)

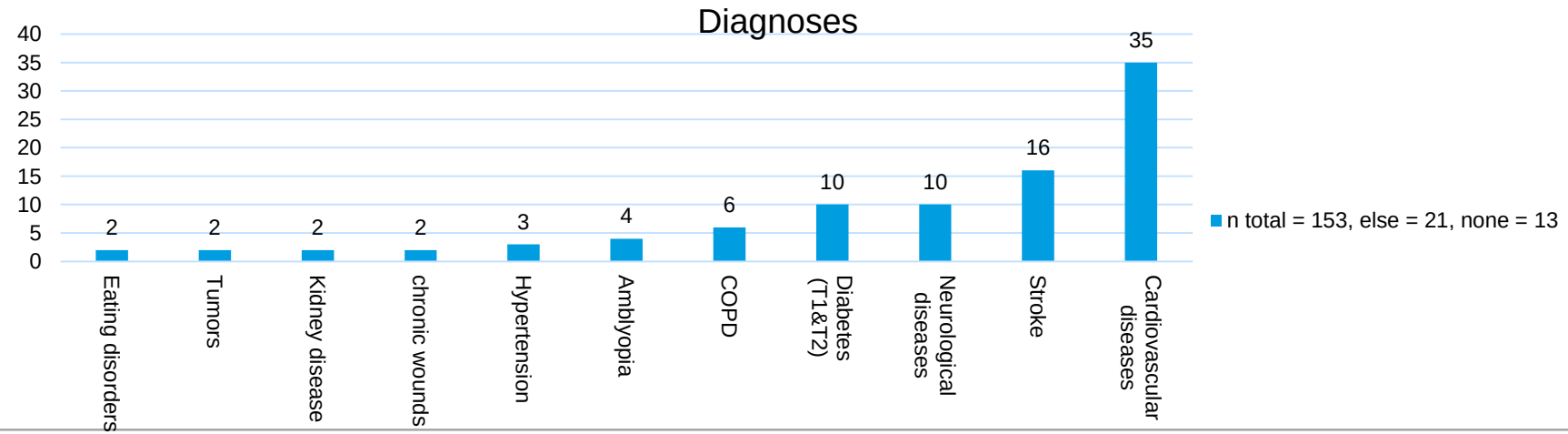
	A	B	C	D	E	F	G	H	I	J	K	L
		Aim of application										
			Aim of Health Education									
		Project Name	Health Education	Diet	Exercise	Self-monitoring	Health Literacy	Health Behaviour	Adherence (treatment/medication)	Psycho-social components of disease	Tele-Consulting	Tele-Diagnosis
1		AOK Curaplan Herz Plus	1	0	0	0	0	0	1		1	
2		Arztentlastende, Gemeindenahe, E-Health-gestützte, Systemische Intervention - AGnES	99 (war nicht standard)	0	0	0	0	0	1	0	0	
3		Augmented Hearing Experience and Assistance for Daily life - AHEAD	0	0	0	0	0	0	0	0	0	
4		Automatisierte internetbasiertes Coachingprogramm für übergewichtige und adipöse Jugendliche - SynX	1	1	1	1	0	1	1	1	0	
5		Blutdruckmanagement	0	0	0	1	0	0	0	0	0	
6		Bundesweites Netzwerk für die Telekooperation in der Medizin - TKmed	0	0	0	0	0	0	0	0	0	
7		Caterna Sehschulung	0	0	0	0	0	0	1	0	0	
8		CCS Telehealth Ostsachsen - Telehealth Ostsachsen										
		Telecoaching	1	0	0	0	0	0	0	0	1	
		Telestroke	1	1	1	1	1	1	0	0	1	
		Telepathologie	0	0	0	0	0	0	0	0	0	
		COPD Rehabilitation										

Ergebnisse III: statistische Analyse

Deskriptive Statistiken







Ergebnisse III: statistische Analyse

Kreuztabelle (Auszug):

Dependent variable	Independent variables = Genotype					
Application Type = Phenotype	Target Disease	Intended Outcome	Medical Specialist Involved	Technology Used	Data Provision	Setting
Tele-consultation n = 20	Stroke (20 %, n = 4)	Optimizing care processes (40 %, n = 8)	Neurologist (30 %, n = 6)	Web (70 %, n = 14)	Image & Video (Real-time) (25 %, n = 5)	Hospital (40 %, n = 8)
	Other neurological diseases (15 %, n = 3)	Increased access to health care (25 %, n = 5)			Text & Image (Store & forward) (10 %, n = 2)	Home (20 %, n = 4)
	Chronic wounds (10 %, n = 2)				Video (Real-time) (10 %, n = 2)	Home & Portable (10 %, n = 2)
						Hospital & Portable (10 %, n = 2)
Tele-diagnosis n = 15	Stroke (40 %, n = 6)	Optimizing care processes (20 %, n = 3)	Neurologist (40 %, n = 6)	Web (53.3 %, n = 8)	Text (Store & forward) (20 %, n = 3)	Hospital (73.3 %, n =11)
		Improvement of diagnosis and early detection (33.3 %, n = 5)			Text & Image (Real-time) (13.3 %, n = 2)	
		Increased access to health care (33.3 %, n = 5)				
Tele-monitoring n = 49	Cardiovascular diseases (55.1 %, n = 27)	Optimizing care processes (32.7 %, n = 16)	General practitioner (24.5 %, n =12)	Telephone (18.4 %, n = 9)	Text (Store & forward) (63.3 %, n = 31)	Home & Portable (75.5 %, n = 37)
	Diabetes (type I and II) (10.2 %, n = 5)	Improvement of hard clinical outcomes (20.4 %, n =10)	Cardiologist (24.5 %, n =12)	Web (14.3 %, n =7)	Text (Real-time & Store & forward) (10.2 %, n = 5)	Home (8.2 %, n = 4)
		Improvement of subjective health (16.3 %, n = 8)	Internist (14.3 %, n = 7)	Web & Telephone (12.2 %, n = 6)	Text (Real-time) (6.1 %, n = 3)	Home & Hospital & Portable (4.1 %, n = 2)
		Improvement of diagnosis and early detection (6.1 %, n = 3)	Diabetologist (8.2 %, n = 4)	Smartphone / App & Telephone (12.2 %, n = 6)		Home & Reha-facility & Portable (4.1 %, n =2)
				Web & Smartphone / App (12.2 %, n = 6)		Home & Hospital (4.1 %, n = 2)

Ergebnisse IV: Korrelationen

- Ergebnisse basieren auf Fisher's Exavt Test (berehnet mir R), da die Voraussetzungen für einen Chi²-Test verletzt teilweise verletzt sind (n nicht in allen Zellen ≥5)

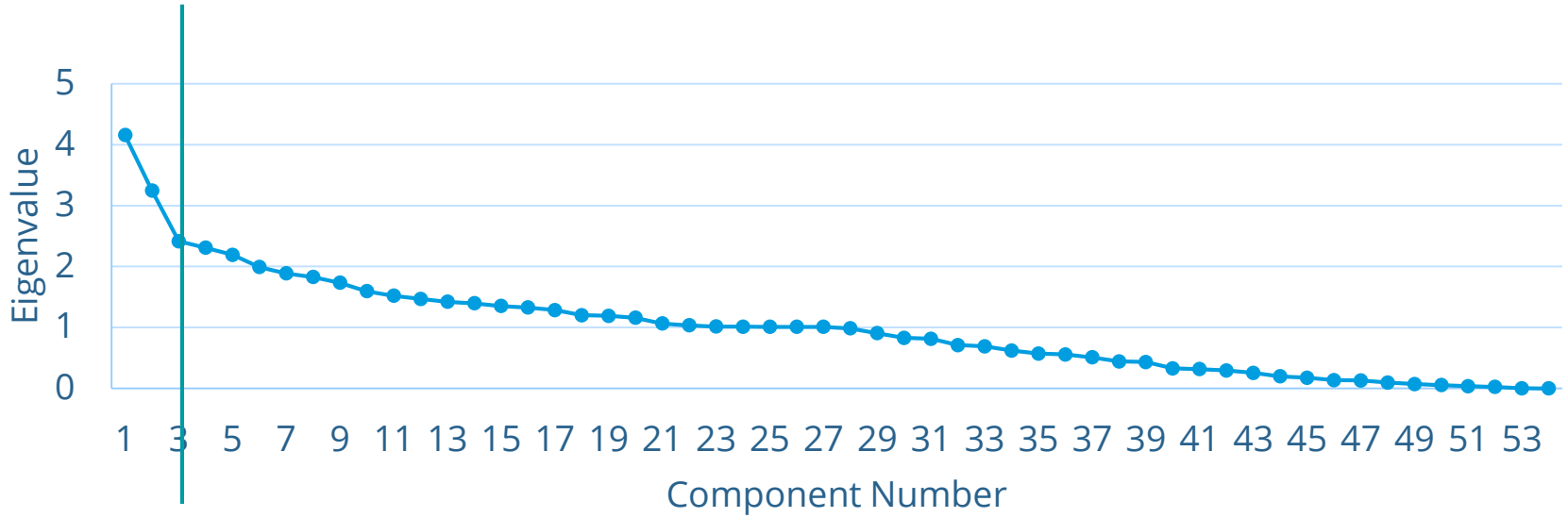
Independent variables	Dependent variable	Significance
Target Disease (H1 a – c)	Application type (tele-consulting, tele-diagnosis, tele-monitoring)	0.0005
Intended Outcome (H2 a – c)		0.0005
Medical Specialist Involved (H3 a – c)		0.0005
Technology Used (H4 a –c)		0.008
Mode of Data Provision (H5 a – c)		0.0005
Setting (H6 a – c)		0.0005

→ Signifikanz ist Beleg für Genotyp-Phänotyp-Korrelationen

→ ABER: Keine Effektstärken bei Fisher's Exact Test

Ergebnisse V: Faktorenanalyse

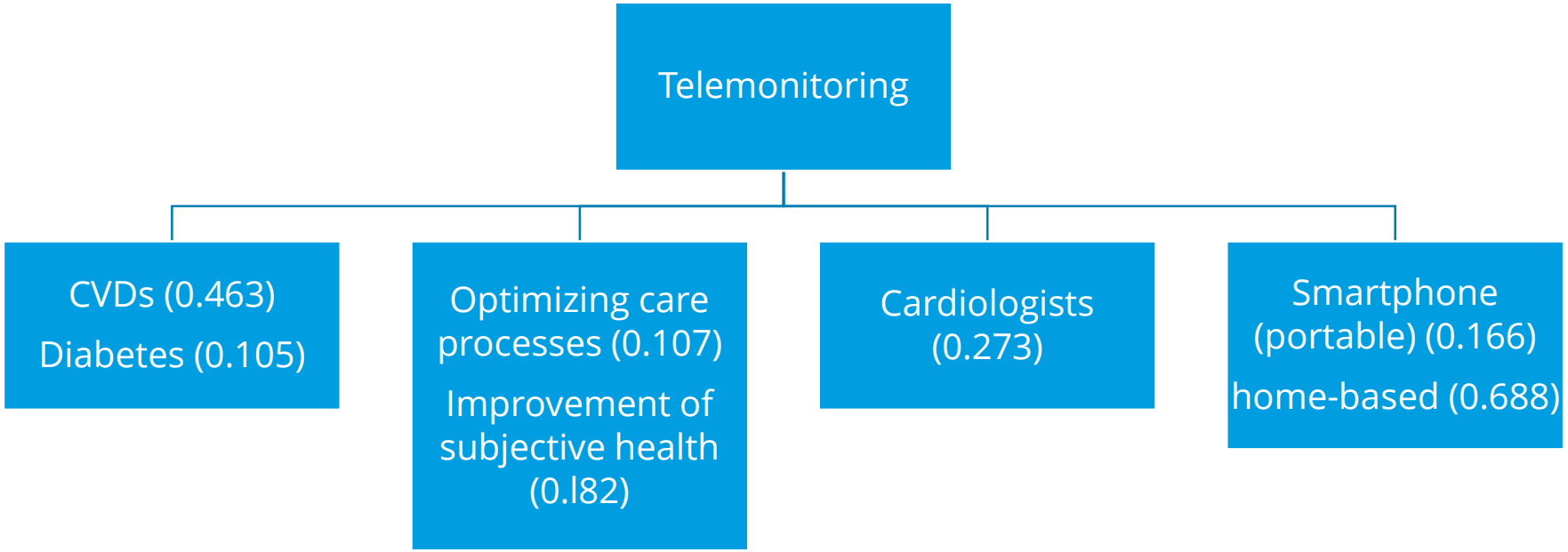
- Screeplot belegt 3-Faktoren-Lösung



Eigene Darstellung

Ergebnisse V: Faktorenanalyse

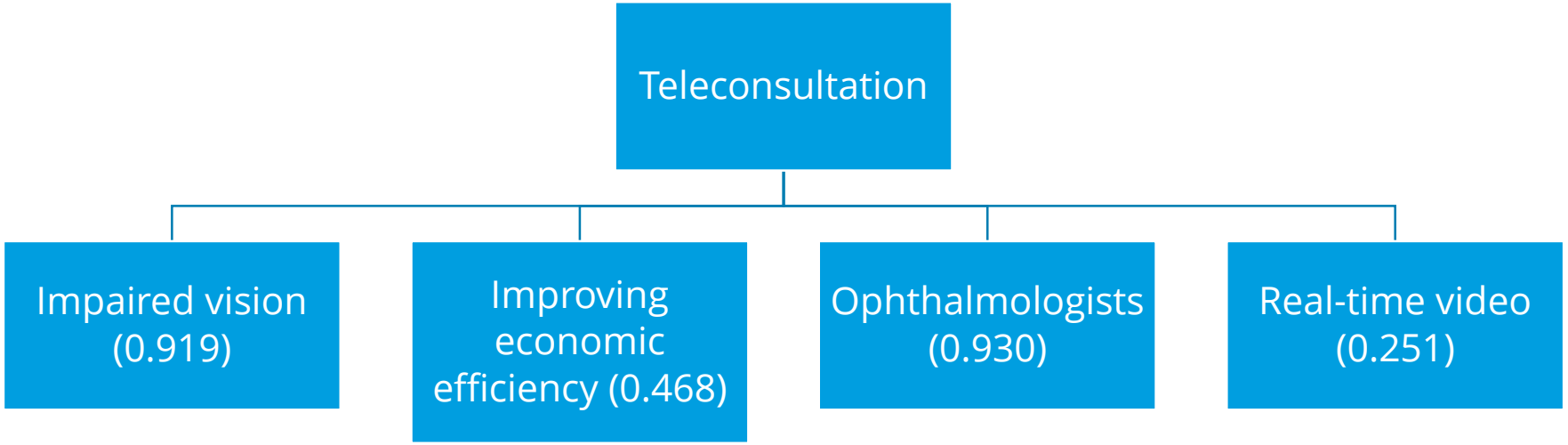
- Faktorladungen zeigen zwei diskriminante Faktoren ☺
- Und einen ambivaltenten ☹



Eigene Darstellung

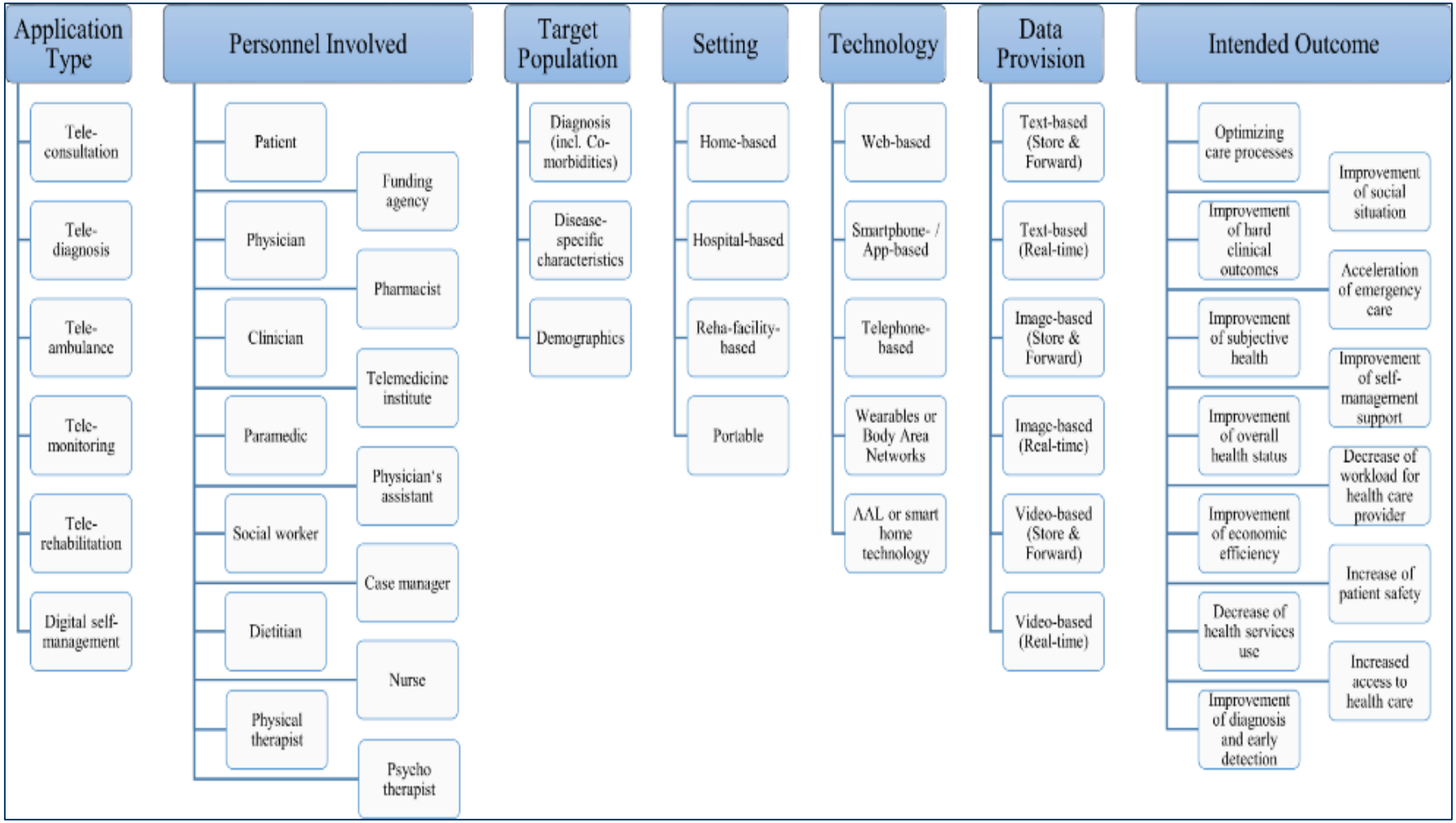
Ergebnisse V: Faktorenanalyse

- Faktorladungen zeigen zwei diskriminante Faktoren ☺
- Und einen ambivalenten ☹



Eigene Darstellung

Ergebnisse VI: Finale Taxonomie



Eigene Darstellung

Diskussion und Fazit

- Methode liefert zwei klar trenn- und benennbare Faktoren
  - Beim dritten ist die Datenlage unzureichend
- Anhand der Taxonomie können individualisierte Anwendungen entwickelt und evaluiert werden, denn sie enthält
  - Relevanze Zielgruppen (Fu et al. 2017)
  - Geeignete Diagnosen (Rush et al. 2017)
  - Beteiligtes Personal (Lee et al. 2017)
  - Basale Technologien (Shen et al. 2018)
  - Relevante Outcomes (Powers et al. 2018, Whelton et al. 2018)

→ Präskriptiver Nutzen

→ Anwendbarkeit quantitativer Inhaltsanalysen in der Versorgungsforschung

Referenzen

Bartlett, E. E., and Windsor, R. A. 1985. "Health Education and Medicine: Competition or Cooperation?," *Health Education Quarterly* (12:3), pp. 219–229. (https://doi.org/10.1177/109019818501200301).

Bashshur, R., Shannon, G., Krupinski, E., and Grigsby, J. 2011. "The Taxonomy of Telemedicine," *Telemedicine and E-Health* (17:6), pp. 484–494. (https://doi.org/10.1089/tmj.2011.0103).

Baumel, A., Birnbaum, M. L., and Sucala, M. 2017. "A Systematic Review and Taxonomy of Published Quality Criteria Related to the Evaluation of User-Facing EHealth Programs," *Journal of Medical Systems* (41:8), p. 128. (https://doi.org/10.1007/s10916-017-0776-6).

Cho, S. J., Kwon, I. H., and Jeong, J. 2015. "Application of Telemedicine System to Prehospital Medical Control," *Healthcare Informatics Research* (21:3), pp. 196–200. (https://doi.org/10.4258/hir.2015.21.3.196).

Costa, R., Carneiro, D., Novais, P., Lima, L., Machado, J., Marques, A., and Neves, J. 2009. "Ambient Assisted Living," in *3rd Symposium of Ubiquitous Computing and Ambient Intelligence 2008*, Advances in Soft Computing, J. M. Corchado, D. I. Tapia, and J. Bravo (eds.), Springer Berlin Heidelberg, pp. 86–94.

Dierks, C. 1999. "Rechtliche und praktische Probleme der Integration von Telemedizin in das Gesundheitswesen in Deutschland," Habilitationsschrift, Habilitationsschrift, Berlin: Humboldt-Universität zu Berlin.

Edmunds, M., Tuckson, R., Lewis, J., Atchinson, B., Rheuban, K., Fanberg, H., Olinger, L., Rosati, R., Austein-Casnoff, C., Capistrant, G., and Thomas, L. 2017. "An Emergent Research and Policy Framework for Telehealth," *EGEMs* (5:2). (https://doi.org/10.13063/2327-9214.1303).

Elasy, T. A., Ellis, S. E., Brown, A., and Pichert, J. W. 2001. "A Taxonomy for Diabetes Educational Interventions," *Patient Education and Counseling* (43:2), pp. 121–127.

Fitch, C. J. 2004. "Information Systems in Healthcare: Mind the Gap," in *Proceedings of the 37th Annual Hawaii International Conference on System Sciences, 2004.*, , January, pp. 1–8. (https://doi.org/10.1109/HICSS.2004.1265367).

Fitzner, K., and Moss, G. 2013. "Telehealth-An Effective Delivery Method for Diabetes Self-Management Education?," *Population Health Management* (16:3), pp. 169–177. (https://doi.org/10.1089/pop.2012.0054).

Fong, B., Fong, A. C. M., and Li, C. K. 2011. *Telemedicine Technologies: Information Technologies in Medicine and Telehealth*. (https://www.wiley.com/en-us/Telemedicine+Technologies%3A+Information+Technologies+in+Medicine+and+Telehealth-p-9780470745694).

Fu, H., McMahon, S. K., Gross, C. R., Adam, T. J., and Wyman, J. F. 2017. "Usability and Clinical Efficacy of Diabetes Mobile Applications for Adults with Type 2 Diabetes: A Systematic Review," *Diabetes Research and Clinical Practice* (131), pp. 70–81. (https://doi.org/10.1016/j.diabres.2017.06.016).

Gregory, J., Robling, M., Bennert, K., Channon, S., Cohen, D., Crowne, E., Hambly, H., Hawthorne, K., Hood, K., Longo, M., Lowes, L., McNamara, R., Pickles, T., Playle, R., Rollnick, S., and Thomas-Jones, E. 2011. "Development and Evaluation by a Cluster Randomised Trial of a Psychosocial Intervention in Children and Teenagers Experiencing Diabetes: The DEPICTED Study," *Health Technology Assessment (Winchester, England)* (15:29), pp. 1–202. (https://doi.org/10.3310/hta15290).

Harst, L., Timpel, P., Otto, L., Richter, P., Wollschlaeger, B., Winkler, K., and Schlieter, H. 2019. "Identifying Barriers in Telemedicine-Supported Integrated Care Research: Scoping Reviews and Qualitative Content Analysis," *Journal of Public Health*.

Hung, K., Zhang, Y. T., and Tai, B. 2004. "Wearable Medical Devices for Tele-Home Healthcare," in *The 26th Annual International Conference of the IEEE Engineering in Medicine and Biology Society* (Vol. 2), , September, pp. 5384–5387. (https://doi.org/10.1109/IEMBS.2004.1404503).

Kille, J., Bungay, V., Oliffe, J., and Atchison, C. 2017. "A Content Analysis of Health and Safety Communications Among Internet-Based Sex Work Advertisements: Important Information for Public Health," *Journal of Medical Internet Research* (19:4), p. e111. (https://doi.org/10.2196/jmir.6746).

Krippendorff, K. 2013. *Content Analysis : An Introduction to Its Methodology /*, (3. ed.), Los Angeles, Calif. [u.a.] : Sage,. (http://slubdd.de/katalog?TN_libero_mab215988326).

Last, J. M. 2007. *An Encyclopedia of Public Health*, New York: Oxford University Press.

Lee, S. W. H., Ooi, L., and Lai, Y. K. 2017. "Telemedicine for the Management of Glycemic Control and Clinical Outcomes of Type 1 Diabetes Mellitus: A Systematic Review and Meta-Analysis of Randomized Controlled Studies," *Front Pharmacol* (8), p. 330. (https://doi.org/10.3389/fphar.2017.00330).

Nickerson, R. C., Varshney, U., and Muntermann, J. 2013. "A Method for Taxonomy Development and Its Application in Information Systems," *European Journal of Information Systems* (22:3), pp. 336–359. (https://doi.org/10.1057/ejis.2012.26).

Referenzen

Otto, L., Harst, L., Schlieter, H., Wollschlaeger, B., Richter, P., and Timpel, P. 2018. *Towards a Unified Understanding of EHealth and Related Terms – Proposal of a Consolidated Terminological Basis*, presented at the 11th International Conference on Health Informatics, Funchal, Madeira, February 2, pp. 533–539. (http://www.scitepress.org/PublicationsDetail.aspx?ID=MoiI1JfDfbE%3d&t=1).

Pearce, G., Parke, H. L., Pinnock, H., Epiphaniou, E., Bourne, C. L. A., Sheikh, A., and Taylor, S. J. C. 2016. "The PRISMS Taxonomy of Self-Management Support: Derivation of a Novel Taxonomy and Initial Testing of Its Utility," *Journal of Health Services Research & Policy* (21:2), pp. 73–82. (https://doi.org/10.1177/1355819615602725).

Poenaru, E., and Poenaru, C. 2013. "A Structured Approach of the Internet-of-Things EHealth Use Cases," in *2013 E-Health and Bioengineering Conference (EHB)*, , November 21, pp. 1–4. (https://doi.org/10.1109/EHB.2013.6707299).

Powers, W. J., Rabinstein Alejandro A., Ackerson Teri, Adeoye Opeolu M., Bambakidis Nicholas C., Becker Kyra, Biller José, Brown Michael, Demaerschalk Bart M., Hoh Brian, Jauch Edward C., Kidwell Chelsea S., Leslie-Mazwi Thabele M., Ovbiagele Bruce, Scott Phillip A., Sheth Kevin N., Southerland Andrew M., Summers Deborah V., and Tirschwell David L. 2018. "2018 Guidelines for the Early Management of Patients With Acute Ischemic Stroke: A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association," *Stroke* (49:3), pp. e46–e99. (https://doi.org/10.1161/STR.0000000000000158).

Ries, M., and Gal, A. 2006. "Genotype–Phenotype Correlation in Fabry Disease," in *Fabry Disease: Perspectives from 5 Years of FOS*, A. Mehta, M. Beck, and G. Sunder-Plassmann (eds.), Oxford: Oxford PharmaGenesis. (http://www.ncbi.nlm.nih.gov/books/NBK11584/).

Rogante, M., Grigioni, M., Cordella, D., and Giacomozzi, C. 2010. "Ten Years of Telerehabilitation: A Literature Overview of Technologies and Clinical Applications," *NeuroRehabilitation* (27:4), pp. 287–304. (https://doi.org/10.3233/NRE-2010-0612).

Rush, K. L., Hatt, L., Janke, R., Burton, L., Ferrier, M., and Tetrault, M. 2018. "The Efficacy of Telehealth Delivered Educational Approaches for Patients with Chronic Diseases: A Systematic Review," *Patient Education and Counseling* (101:8), pp. 1310–1321. (https://doi.org/10.1016/j.pec.2018.02.006).

Schulz, E. G., Stahmann, A., and Neumann, C. L. 2015. "Telemedicine: Interventional Decentralised Blood Pressure Telemonitoring (IdTBPM)," *Swiss Medical Weekly* (145), p. w14077. (https://doi.org/10.4414/smw.2015.14077).

Shen, Y., Wang, F., Zhang, X., Zhu, X., Sun, Q., Fisher, E., and Sun, X. 2018. "Effectiveness of Internet-Based Interventions on Glycemic Control in Patients With Type 2 Diabetes: Meta-Analysis of Randomized Controlled Trials," *Journal of Medical Internet Research* (20:5), p. e172. (https://doi.org/10.2196/jmir.9133).

Sheridan, N., Kenealy, T., Kuluski, K., McKillop, A., Parsons, J., and Wong-Cornall, C. 2017. "Are Patient and Carer Experiences Mirrored in the Practice Reviews of Self-Management Support (PRISMS) Provider Taxonomy?," *International Journal of Integrated Care* (17:2), p. 8. (https://doi.org/10.5334/ijic.2483).

Sood, S., Mbarika, V., Jugoo, S., Dookhy, R., Doarn, C. R., Prakash, N., and Merrell, R. C. 2007. "What Is Telemedicine? A Collection of 104 Peer-Reviewed Perspectives and Theoretical Underpinnings," *Telemedicine and E-Health* (13:5), pp. 573–590. (https://doi.org/10.1089/tmj.2006.0073).

Tulu, B., Chatterjee, S., and Laxminarayan, S. 2005. "A Taxonomy of Telemedicine Efforts with Respect to Applications, Infrastructure, Delivery Tools, Type of Setting and Purpose," in *Proceedings of the 38th Hawaii International Conference on System Sciences*, Big Island, Hawaii. (http://doi.ieeecomputersociety.org/10.1109/HICSS.2005.56).

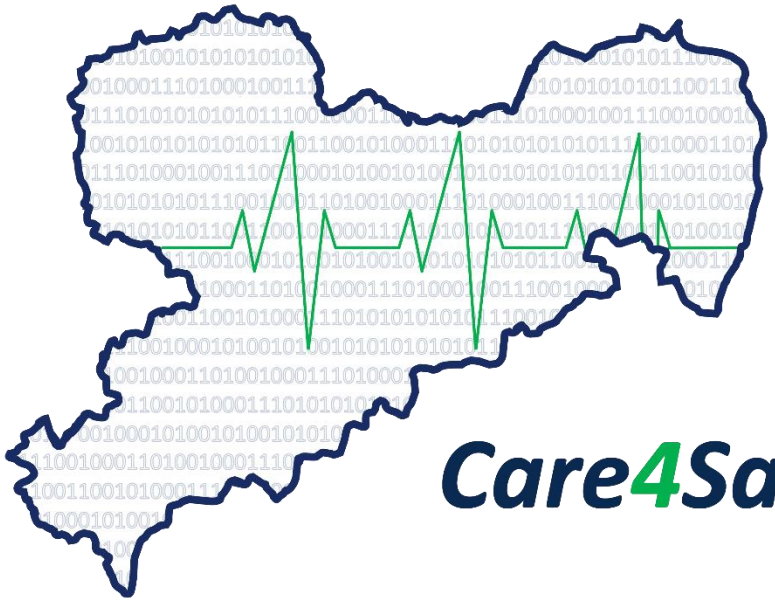
Usman, M., Britto, R., Börstler, J., and Mendes, E. 2017. "Taxonomies in Software Engineering: A Systematic Mapping Study and a Revised Taxonomy Development Method," *Information and Software Technology* (85), pp. 43–59. (https://doi.org/10.1016/j.infsof.2017.01.006).

Valentijn, P. P., Vrijhoef, H. J. M., Ruwaard, D., Boesveld, I., Arends, R. Y., and Bruijnzeels, M. A. 2015. "Towards an International Taxonomy of Integrated Primary Care: A Delphi Consensus Approach," *BMC Family Practice* (16), p. 64. (https://doi.org/10.1186/s12875-015-0278-x).

vesta Informationsportal. 2019. "Startseite," *vesta Informationsportal*. (https://www.informationsportal.vesta-gematik.de/, accessed February 28, 2019).

Vincent, A., Cusack, C. M., Pan, E., Hook, J. M., Kaelber, D. C., and Middleton, B. 2007. "A New Taxonomy for Telehealth Technologies," *AMIA ... Annual Symposium Proceedings. AMIA Symposium*, p. 1145.

Whelton, P. K., Carey, R. M., Aronow, W. S., Casey, D. E., Collins, K. J., Dennison Himmelfarb, C., DePalma, S. M., Gidding, S., Jamerson, K. A., Jones, D. W., MacLaughlin, E. J., Muntner, P., Ovbiagele, B., Smith, S. C., Spencer, C. C., Stafford, R. S., Taler, S. J., Thomas, R. J., Williams, K. A., Williamson, J. D., and Wright, J. T. 2018. "2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults: Executive Summary: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines," *Hypertension (Dallas, Tex.: 1979)* (71:6), pp. 1269–1324. (https://doi.org/10.1161/HYP.0000000000000066).



Care4Saxony

Vielen Dank!