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A general framework for selecting work participation outcomes in intervention studies among persons with health problems: a concept paper

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Abstract

Background: Work participation is important for health and can be considered as engagement in a major area of life which is of significance for most people, but it can also be thought of as fulfilling or discharging a role. Currently, academic research lacks a comprehensive classification of work participation outcomes. The International Classification of Functioning is the foremost model in defining work functioning and its counterpart work disability, but it does not provide a critical (core) set of outcomes. Standardizing the definitions and nomenclature used in the research of work participation would ensure that the outcomes of studies are comparable, and practitioners and guideline developers can better decide what works best. As work participation is a broad umbrella term including outcome categories which need unambiguous differentiation, a framework needs to be developed first.

Aim: To propose a framework which can be used to develop a generic core outcome set for work participation.

Methods: First, we performed a systematic literature search on the concept of (work) participation, views on how to measure it, and on existing classifications for outcome measurements. Next, we derived criteria for the framework and proposed a framework based on the criteria. Last, we applied the framework to six case studies as a proof of concept.

Results: Our literature search provided 2106 hits and we selected 59 studies for full-text analysis. Based on the literature and the developed criteria we propose four overarching outcome categories: (1) initiating employment, (2) having employment, (3) increasing or maintaining productivity at work, and (4) return to employment. These categories appeared feasible in our proof-of-concept assessment with six different case studies.

Conclusion: We propose to use the framework for work participation outcomes to develop a core outcome set for intervention studies to improve work participation.

Keywords: Work participation, Return to work, Sick leave, Employment, Occupational functioning, Work ability, Outcome measurement, Occupational health, Vocational rehabilitation, Research framework, core outcome set

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Introduction

According to the World Disability Report of 2011, about 978 million adults experience a form of disability which impairs their functioning in daily life [1]. Having a disability may have a negative impact on well-being due to associated social isolation, poor mental health and



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strained family relationships [2]. Societal repercussions include government expenditure on disability benefits, reduced work capacity in terms of attendance and productivity and early retirement schemes which in total may account for ~2% of GDP in OECD countries [1]. Even though paid work participation is a concern on the socioeconomic level, it is particularly important in the fields of rehabilitation and occupational health. In research, much effort is directed at interventions to increase work participation in people with ill health [3].

Systematic reviews provide insight into which interventions are beneficial and help guide future guidelines, practice and policy [4]. However, researchers and authors of systematic reviews on work participation in relation to health have reported the challenges of heterogeneous outcome measurement in trials which impedes large-scale evidence comparison [5–9]. Variability in the use of terminology is one of the reasons why comparison is currently difficult [10, 11]. Work participation and work disability are not clearly defined terms and are used with varying meanings. To resolve communication issues, the WHO developed the International Classification of Functioning, Disability and Health (ICF) [12]. In the ICF, participation in general is defined as involvement in a life situation. Work and employment are major life situations in which people should be able to participate in spite of ill health [13]. Following Alheresh and Keyser's interpretation of the ICF [14], work functioning is defined as an overarching term for work activities and work participation, and work disability as a limitation of work activities or a restriction of work participation. This makes work disability a broad term denoting that people with impaired health have difficulty in performing work related tasks or maintaining employment.

Although vocational rehabilitation and occupational health fields use different terms, the aims and general content of interventions are the same. However, clear distinctions need to be made for outcome categories. Studies evaluating the effects of drug therapy on work productivity require different work outcome measures than studies evaluating supported employment interventions enabling unemployed people to enter the job market [10]. We have previously shown extensive variability in the use of outcome measurements across studies evaluating work outcomes [10].

Core Outcome Sets (COS) are recommended as a solution to heterogeneous outcome measurements [15]. A COS is an agreed set of minimum outcomes which should be measured in all trials in a specific health area. Only the consistent use of COS will allow large-scale pooling of outcomes and decrease outcome reporting bias [16]. One of the most prominent examples of the development of a COS is the Outcome Measures in

Rheumatology Initiative (OMERACT). Over the past 30 years, a group of researchers in the field of rheumatology has worked on recommending or developing a range of outcome measurements including work participation for people with rheumatic and musculoskeletal diseases [17]. Due to this initiative, unambiguous outcome reporting of randomized controlled trials (RCTs) within rheumatology has considerably improved [15, 18].

Many authors have discussed conceptual issues of measuring work participation through a range of perspectives, but no overview exists [19–23]. To date, no COS exists for work participation outcomes that can be used for intervention studies to improve work participation for people experiencing health problems. To that end, we started a project to develop a generic COS for work participation (COS for Work) (<http://www.cosforwork.org/>).

Our systematic review on how work outcomes are measured across disciplines found two main categories of interventions that use work participation for their evaluation [10]. Studies that report vocational interventions aim to directly improve work-related or work ability related factors. Medical or clinical studies that report non-vocational interventions aim to indirectly impact work participation by improving clinical features and use symptoms or signs as their primary outcome and measure work participation improvements as a secondary outcome. The scope of the COS for Work includes outcomes that measure the success of all kinds of interventions aimed at impacting work participation whether these are vocational or clinical or a combination of the two.

Before developing a COS, it is important to understand what factors to consider when selecting and measuring work participation outcomes. In this initial stage, we aim to propose a framework for the development of the generic COS.

The objectives of this concept paper are:

i) to provide an overview of theoretical perspectives on work participation interventions and their outcome measurements, ii) to evaluate the literature for classifications of work participation outcomes, iii) to derive criteria for classifying work participation outcomes, and iv) to propose a framework to support the selection of work participation outcomes for interventions aiming to help people with (general or specific) health problems and to test the framework as proof of concept.

Methods

We followed the guidance on writing conceptual papers [24, 25] which aim to bridge existing theories, provide multi-level insights, broaden the scope of our thinking or provide or adapt theories or result in a new typology. The concept of this paper focusses on a framework for

typifying existing work participation outcomes. We used existing concepts and theories that we located through a systematic literature search as the input for our analysis. The findings were synthesized in a narrative way. To identify previous studies on definitions or classifications of work participation outcomes (Fig. 1), we conducted a systematic literature search and used the following eligibility criteria to select articles: the study should (1) include people who either work or want to work (more), (2) focus on change in work participation due to an intervention, and (3) refer to a theory, framework, model or categorization of work participation outcomes or elements of work participation. We constructed a search strategy in MEDLINE (PubMed) (Additional file 1: search strategy) and searched from inception (1966) up to 22/10/2021. Grey literature was searched using the general search engine Google. Because Google has its own search algorithm, we only used the search terms sick leave, sickness absence, work ability, or disability in combination with theory, concept or classification. As Google sorts according to relevance, we explored the first 20 hits further. In addition, we searched our personal files for relevant studies. One author (JV) removed references that did not fulfil the inclusion criteria. Three authors (MR, JV, JH) then selected references for full-text assessment and inclusion based on the full text. We extracted

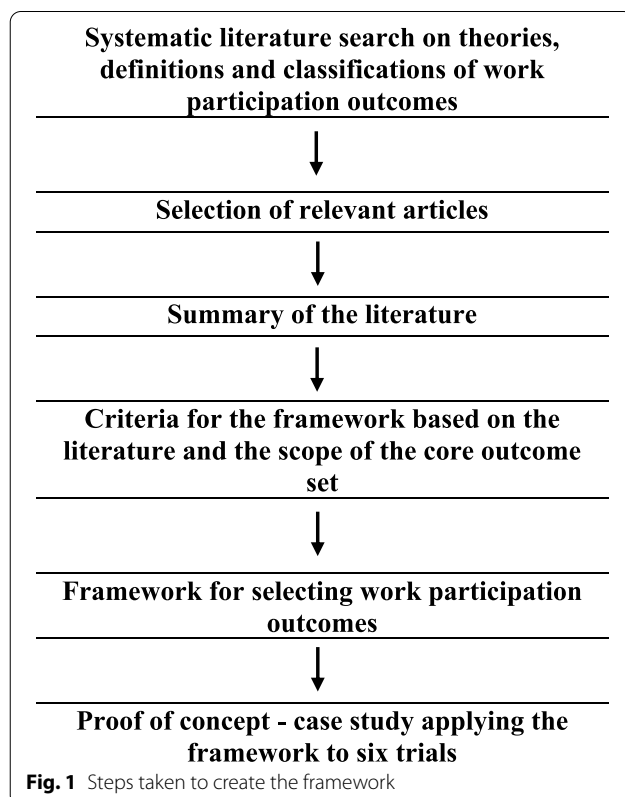
data on whether the article described a classification, the name of the classification, and the specific classification or outcome addressed.

Using the selected studies, we summarized existing theories that described (work) participation in general, classifications of work outcomes and current definitions of specific work outcomes. Next, to build our framework we identified criteria that were derived from the literature and described these. We used the criteria to create a new framework that can serve as a starting point for selecting work participation outcomes for the COS for Work. The elements for this framework were developed using COS methodology from COMET initiative [16] and was guided by the scope of the COS for Work (i.e., outcomes relevant for any type of intervention aiming to impact work participation for individuals with any type of health problem). Based on the identified literature one author (MR) drafted a proposal of the criteria which were then discussed by all authors during three online meetings to improve the terminology, to evaluate priorities and to discuss to what degree these criteria were feasible to implement. All authors participated in group discussions and provided written comments. The authors cover a wide area of expertise such as occupational medicine, physiotherapy, occupational therapy, epidemiology and systematic review methodology.

Finally, as a proof of concept, we performed a case study where we applied the framework of work participation outcomes to six RCTs that constituted a representative sample of short-term, intermittent and long-term health conditions studied in work participation research. This step was important as COS for Work is not disease specific and should be relevant for all types of health problems.

We took the following approach to assess / determine proof of concept: First, we identified six common health conditions with different courses of disease typically impacting work participation (schizophrenia, depression, rheumatoid arthritis, breast cancer, influenza, various health problems causing sick leave). Second, for each entity, we identified RCTs (or protocol of an RCT) with a vocational or non-vocational intervention and at least one work participation outcome. Third, for each RCT two researchers (MR and JV) determined whether the intervention was vocational or non-vocational and whether the framework could be applied to categorize the vocational outcomes. Finally, they determined whether measurement of the outcomes would meet our mandatory and optional COS criteria.

Regarding terminology, we refer to *an outcome* as the endpoint of a trial that is expected to change, such as symptoms, sick leave or return to work. We define *an outcome measurement method* as the way in which



the outcome is measured e.g., through interviews, self-report, data collection from registries or questionnaires. *Outcome measurement instruments* are instruments which are used to measure the specific outcome, such as validated or self-constructed questions or questionnaires.

Results

The search in MEDLINE (PubMed) yielded 2106 references, of which 296 were considered relevant. Most of the 1810 irrelevant references were about the application of the ICF for a specific disease and not about work participation. An additional 60 references were found through the Google search or from our personal files. Having screened these 356 references, we selected 67 for full-text analysis and included 59 articles. Fifteen studies provided a theoretical perspective of work participation based on the ICF (section A). Thirty-six studies described how to measure effectiveness of work participation interventions (section B). Eight studies provided a classification of work participation outcomes (section C). Based on the literature and the scope of our COS, we identified six mandatory criteria and two optional criteria that the framework should meet (section D). The framework we constructed includes four distinct work participation stages with relevant outcomes for each stage (section E). As a proof of concept we established a fit between the work participation outcomes of the six RCTs and the criteria of the framework (section F).

A. Views on the concept of participation: “The International Classification of Functioning”

Strengths and limitations

The ICF, approved by the WHO in 2001 [26], constitutes the predominant theoretical classification of societal participation among individuals with health problems. The model is valued and broadly adopted due to its universality, comprehensiveness [27], and the capability to consider disability through a biopsychosocial perspective [28]. The ICF assesses activities and participation either on the level of having the *general capacity* to do an activity in a standardized environment or as *actual performance* within the context of their daily life [29]. However, the scientific community finds that the ICF is too ambiguous and incomprehensive for informing how to measure participation — its definitions do not ensure that activities and participation are mutually exclusive [30, 31]. It lacks the subjective aspect of participation (for example: satisfaction) [32, 33] and existing measurement instruments based on the ICF contain only very general questions about (work) participation [34, 35]. Moreover, the ICF codes within the (sub-) chapters do not explain the dynamics between health states, functions and how

changes occur over time in the context of work participation [28, 36].

The ICF does not address the normative character of participation. Participation can be seen as performing or discharging a social role [37–40], but there is no universal standard for a “normal” level of participation. The worker role is clearly distinct from other social roles [41]. Paid work which is the focus of this project differs from volunteering work and has different normative aspects which should be considered in terms of outcome measurement.

ICF Core Sets are made to narrow down the list of about 1400 categories to what is most relevant to consider in practice or research for a specific setting or health problem [42]. However, such sets are not made exclusively for core outcome measurements in research and would still contain too many items. A *Core Outcome Set* must represent a minimum set of outcomes which are feasible and relevant to measure across all trials within a specific health field [16].

B. Views on measuring work participation

General work participation and disability evaluation

Work participation is influenced by personal and environmental factors, such as motivation, the work environment, and national policies. The most important outcome domains or stages of work participation to be measured are context-specific. Table 1 summarizes theories of how to capture (effectiveness) results of work participation interventions. Although the ICF has been preferred as reference point, no final recommendations were made on specific critical outcomes or measurement instruments that could be used for a generic COS for Work.

Prevalent work participation outcomes

We reviewed the literature on specific types of work participation outcomes and constructs, as well as the methodological issues to be considered. Here, we list the most prevalent types of outcomes discussed in the order of most to least frequently measured – as found in our systematic review [10]. *Sickness absenteeism* can be defined as the decision to not attend or inability to attend work due to an illness. The decision process is phased over time and may be influenced by the supervisor - subordinate relationship, individual capacities and incentives [54–56]. *Return to work* (RtW) is influenced by factors which may differ for the stakeholders involved. In terms of RtW measurements, aspects like sensitivity to change or validity need to be considered [22, 57–63]. *Productivity* is often measured by a combination of outcomes, such as employment status, absenteeism and presenteeism. While presenteeism is receiving increasing attention in the evaluation of productivity, there is no consensus on how best to measure it. Generic measures of work

Table 1 Perspectives of theories and models on measuring general work participation

Study	Subject	Summary
What issues should be considered when measuring work participation		
Iwanaga et al. [43] 2019 Goldman [44] 2013, Marfeo et al. [45] 2013, Anner et al. [28] 2012, Berglind & Gerner [46] 2002	Describe measuring (partial) disability.	Recommendations on disability evaluation which incorporated the ICF in the evaluation. Motivation and self-efficacy are important to include in disability evaluation as they are predictors of work participation.
Kim & Rhee [47] 2018	Describe how policy changes impact transitions between employment states.	Policy against disability discrimination may positively impact job retention of the (partially) disabled workers and negatively impact the inflow to the employment market of (partially) disabled and unemployed individuals.
Jetha et al. [48] 2016	Capture the complexity of work disability research.	System dynamics modelling should be applied to work participation research. Dynamic behaviours between individual, psychosocial, organizational and regulatory components need to be seen in terms of feedback loops rather than a linear process. However, this would be time consuming and complex.
Combs & Heaton [49], 2016 Sandqvist & Henriksson [50] 2004	Provide conceptual analyses of work functioning and what is important to measure.	Work participation should be seen through a holistic lens with most important components closely related to the structure of ICF.
Mehnert et al. [51] 2013	Identify which work outcomes are most important to measure for cancer survivors.	Based on existing frameworks, the following outcomes are important for cancer survivors: employment, return to work, work ability, work performance, job opportunities, income, work satisfaction, job promotion and training and sustainability in work retention.
Use of existing models and tools to measure work participation		
Momsen et al. [52] 2019	Operationalize ICF for vocational rehabilitation.	The ICF can be used to operationalize vocational rehabilitation. More research required to standardize the use of ICF.
Sternberg & Bethge [53] 2018, Mateen et al. [7] 2017	Review existing work outcome measures.	Evaluation of a broad range of instruments measuring work participation based on their psychometric properties. No final recommendations could be made.

performance may include measures such as task performance, counterproductive work behaviours, and adaptive performance [64–71]. *Work ability* defined as self-perceived potential for work participation, is measured mainly on the level on capacity rather than performance [72–75].

C. Classification of work participation outcomes

Of the eight studies that provided a classification of recommended outcomes and measures for work participation, one considered the most commonly used outcome measures (including employment status, sick leave, return to work, and role functioning) [20], five used ICF items [14, 33, 42, 76, 77], and two looked at productivity [78] and absenteeism [19] separately (Table 2). A meaningful general classification of work capacity outcomes may require additional considerations, such as the aim of the study, which often revolves around the effectiveness of an intervention, or the perspective taken in the study, i.e., that of employers, workers, or society. With regard to using the ICF to operationalize work participation outcomes, some suggested using *work functioning* as an

overarching term for work activities, such as driving, and *work participation* for maintaining desired employment.

Work disability may mean a limitation on work activities, such as difficulty in driving, or a participation restriction, such as the number of hours lost from work. The relationship between participation and disability can be influenced by contextual factors, and people can move in and out of limitations and restrictions over time. *Restrictions on work participation* include restrictions in fulfilling the worker-role, expressed as a lesser than desired status in work productivity, employment status, career advancement or job opportunities [14].

Researchers have proposed varying lists of ICF items [33, 42, 76] and measurement instruments that could be used to measure a core set of ICF items for vocational rehabilitation [77]. However, these lists address a broad spectrum of issues related to vocational rehabilitation beyond outcomes that measure the effectiveness of interventions and do not intend to be a classification of outcomes to be used in trials.

A recent COS for rheumatoid arthritis evaluated measurement instruments for at-work productivity loss which included absenteeism and presenteeism, measured as

Table 2 Current classifications for work participation outcomes

Outcome category	Study	Aim	Findings	Perspective
General work participation	Luna et al. [77] 2020	To identify measurement instruments for the ICF core set for vocational rehabilitation.	13 instruments covered 58 categories (64.5%) of the core set: 13 (76.5%) of the body functions component, 29 (72.5%) of the activities and participation component and 16 (49%) environmental factors.	Worker
	Alheresh et al. [14] 2015	To organize and define ICF-based work participation outcomes.	Definitions for disability, activity, participation, activity limitations, and participation restrictions.	Worker, employer, societal, economic
	Finger et al. [42] 2012	Brief ICF core set important for vocational rehabilitation.	Consensus about brief Core Set including 13 ICF categorized items: 6 for activities and participation, 4 for environmental factors, 3 for body functions.	Healthcare
	Escorpizo et al. [76] 2011	List of ICF items relevant for vocational rehabilitation.	The following 101 ICF categories were listed as relevant for work participation: 22 for body functions, 13 for body structures, 36 for activities and participation, and 30 for environmental factors.	Healthcare
	Glassel et al. [33] 2011	List of ICF items relevant for patients in vocational rehabilitation.	List contains 160 ICF categories. ICF components (a) body functions, (b) activities and participation and (c) environmental factors were equally represented, while (d) body structures appeared less frequently.	Worker
Productivity	Amick et al. [20] 2000	To review and illustrate a sample of work outcome measures.	Five reasons and measures for work outcomes: 1. Productivity loss in clinical trials; 2. Effects of health services; 3. Effects of injury prevention; 4. Effects of work reorganization, such as ergonomic changes; 5. Improvement of the provider – worker interaction.	Worker, employer, societal, economic
	Beaton et al. [78] 2016	To recommend OMERACT productivity measures for Rheumatoid Arthritis.	Provisional recommendations: WALs (Workplace Activity Limitations Scale), WLQ-25 PDmod (Work Limitations Questionnaire with modified physical demands scale), WAL (Work Ability Index), WPS (Arthritis-specific Work Productivity Survey), and WPAI (Work Productivity and Activity Impairment Questionnaire).	Patient, economic
Absenteeism	Hensing et al. [19] 1998	To examine sick leave measures used in research.	Five measures for sick leave spells are recommended: frequency, length, incidence rate, cumulative incidence and duration.	Epidemiological

‘number of days or hours off work,’ or ‘difficulties at work’ [78]. However, currently there is no agreed measure of presenteeism which is underpinned by economic theory [68, 69, 79]. For measuring sick leave, five measures of sick leave spells have been suggested: their frequency, length, incidence rate, cumulative incidence, and duration [19, 80, 81].

D. Criteria used by the framework for work participation outcomes

Our discussions concluded that not all criteria are equally relevant and feasible to measure for interventions with varying aims. Therefore, we distinguished between six mandatory and two optional criteria (Table 3). In addition, outcome measures should capture transitions in work participation [55, 63] in which people with a health problem seek work, are absent from work, or who are at risk of losing their jobs. This criterion applies to the COS as a whole, because no single outcome captures transitions between work phases.

E. Framework for work participation outcomes

Using the ICF, we established four stages of work participation that should help identify outcomes that potentially

fit into a COS for Work: *Stage 1: Initiating employment; Stage 2: Having employment; Stage 3: Increasing or maintaining productivity at work; Stage 4: Return to employment*. These stages do not represent an order but represent different situations that inform whether a particular stage is applicable and can be used to select an outcome.

Stage 1: initiating employment

Outcomes relevant for work participation within this stage help determine whether participants are ready for initiating employment. ICF categories “apprenticeship” (work preparation)” and “acquiring a job” apply. The target group is unemployed at baseline (not self-employed or contracted by an employer, but possibly with a type of subsidized governmental wage replacement benefit). The intervention types are commonly vocational, such as Individual Placement and Support programs which help people with a chronic mental health problem to gain work [10]. They focus on increasing skills, knowledge, or attitude of participants for successful engagement in a worker role. Outcomes could measure time to first job, readiness for work, motivation for work, or job seeking skills (Table 4).

Table 3 COS Criteria: outcomes used in COS for Work should meet these criteria

Outcomes should	Reason for inclusion
<i>Mandatory criteria</i>	
1. Be sensitive to change	The aim of using a COS is to compare outcomes of intervention studies [16]. This implies that the measures of the outcomes need to be sensitive to change [61, 80] for any type of intervention study which may impact work participation.
2. Be feasible to measure	COS outcomes should represent a minimal set of outcomes that can be measured [16].
3. Be applicable internationally	COS are developed for international use to make large scale evidence synthesis possible [16].
4. Be specific for work participation	Outcomes should relate to paid work to address specific factors of the worker role that are not transferable to voluntary work [41].
5. Capture the perspectives of multiple stakeholders	Work participation outcomes are of relevance for people who (aim to) work, employers, policy maker, health professionals, and researchers [47–50].
6. Be in alignment with the ICF model	The ICF is a widely used model in (occupational) health sciences and practice [13, 14, 27, 28, 33, 77].
<i>Optional criteria</i>	
7. Be used for cost-effectiveness studies	Cost-effectiveness analysis is important for societal decision making.
8. Be applicable across different insurance schemes	As COS for Work is intended to be applicable internationally, the outcomes should be as relevant as possible, irrespective of different insurance schemes.

Table 4 Work participation stage “Initiating employment”

Target group	Type of intervention	Examples of outcomes
- Unemployed individuals aiming to get work	- Vocational interventions helping people with a health problem to gain employment	- Time to first job - Readiness for work - Motivation for work - Job seeking skills - Job interview skills

Stage 2: having employment

Outcomes relevant for this stage of work participation indicate whether a person is in employment, can retain employment or loses employment within the duration of the intervention study. These outcomes fit the ICF categories “remunerative employment” or “keeping a job”. Having employment entails producing goods or services in exchange for a monetary compensation, salary or wage – with an employer or as self-employed [82, 83]. Unemployment can be seen as involuntary joblessness [84]. The target group are people at risk of losing employment due to a health problem, like cancer survivors [51, 85], patients with cardiovascular disease or diabetes [86] whose disease status is associated with a higher unemployment rate. At the start of interventions persons for whom it is difficult to become employed may also progress from unemployment to having employment – in such cases it is also important to have measures on whether and for how long the participants were employed.

Relevant interventions can be vocational or non-vocational (Table 5). Vocational rehabilitation studies commonly have a primary aim to investigate the effect of an intervention on employment status, while medical or pharmaceutical studies tend to measure the effect of the intervention (often a new drug) on employment status as a secondary outcome. The outcomes within this stage pertain to the employment status of the individual for the duration of the study.

Stage 3: increasing or maintaining productivity at work

Outcomes relevant to this stage of work participation refer to people who experience limitations / restrictions with working or have less output, i.e. loss of productivity. In terms of ICF, the outcomes could be placed under the

category “maintaining a job”. The target group are individuals holding a job and experiencing functional problems at work due to health problems. Interventions could address vocational measures such as providing work related rehabilitation, or non-vocational interventions such as medical drugs. Both types of interventions may impact outcomes such as: work ability, work functioning, work impairment or overall productivity (loss) (Table 6). The latter is often used to calculate costs [67, 69]. From the worker perspective, feeling fit to work is essential for a successful work life. To this end, employers can provide preventive measures, aiming to reduce stress and increase wellbeing at work [87, 88].

Stage 4: return to employment

Outcomes relevant for this stage of work participation determine whether people who have been (temporarily) unable to work and have been on sick leave, successfully resume work. We thereby consider absenteeism (e.g., sick leave) and return to work as measures from different perspectives, but belonging to the same concept of not working (fully) in spite of having employment. The ICF does not provide a category sickness absence, but outcomes for this stage could fit under the ICF categories “maintaining employment” and “remunerative employment”.

Sickness absence can show that a person is unable to fulfil their worker role due to ill health, but other reasons for absenteeism, such as maternity leave or unwillingness to come to work also exist. Vocational rehabilitation designed to help workers return to work includes outcomes of work participation as primary outcome. But any type of clinical, pharmaceutical or otherwise health related intervention may indirectly impact outcomes relevant for this stage (Table 7). Common outcomes are return to work rate, time to return to work, sick leave

Table 5 Work participation stage “Having employment”

Target group	Type of intervention	Examples of outcomes
<ul style="list-style-type: none"> - Unemployed individuals aiming to get work - Employed persons at risk of losing employment 	<ul style="list-style-type: none"> - Vocational interventions aiming to help people gain work or prevent people from losing work - Non-vocational interventions 	<ul style="list-style-type: none"> - Employment rate (part/full time) - Employment duration - Job loss - Early retirement due to ill health

Table 6 Work participation stage “Increasing or maintaining productivity at work”

Target group	Type of intervention	Examples of outcomes
<ul style="list-style-type: none"> - Individuals holding a job and experiencing functional problems at work due to a health problem 	<ul style="list-style-type: none"> - Vocational interventions providing work related rehabilitation - Work related vitality interventions - Non-vocational interventions which may also impact at-work functioning 	<ul style="list-style-type: none"> - At-work productivity loss - Work ability - Work activity impairment - Vitality at work

Table 7 Work participation stage “Return to employment”

Target group	Type of intervention	Examples of outcomes
- Individuals holding a job but not working (fully) due to health reasons	- Non-vocational interventions which may impact sick leave (clinical, pharmacological) - Vocational interventions aiming to help people get back to work	- Return to work rate (part/fulltime) - Time to return to work - Sick leave rate - Sick leave duration - Intention to return to work - Return to work self-efficacy - Need for recovery

rate, sick leave duration or frequency. Others report perceived capacity to return to work, such as intention to return to work, return to work self-efficacy or the need for recovery from work.

More recently, ‘return to work’ has been introduced as an indicator of sickness absence with an individual perspective, when the worker role is important for economic reasons and for reasons of well-being, e.g., when cancer survivors report that getting back to work is a final step in getting back to normal life after their disease and treatment experience [51].

Absenteeism outcomes are frequently approached from a societal or economic perspective [89]. Importantly, sick leave time can be converted into monetary value as part of economic evaluations to indicate extra costs for the employer or/and the employee.

Disease trajectories and stages of work participation Different disease trajectories may predetermine which stages of work participation the outcome measurement should focus on, as illustrated in Fig. 2 which includes five common diseases [90–95]. Besides the disease status or its course of progression (chronic, progressive, intermittent, relapsing, resolving), the baseline status of the target group (employed-unemployed, seeking-maintaining-losing work) may determine the preferred outcome, and the specific intervention types or aims [11].

F. Feasibility of the framework as a proof of concept

The predefined COS criteria could be applied to almost all measured outcomes in the six RCTs (Table 8) that we selected to evaluate proof of concept. Since we had to take a number of assumptions, some caveats apply:

For criteria 1 (sensitive to change) and 2 (feasible to measure), we assumed that the outcomes measured in the studies fulfilled these criteria, without confirmation from robust evidence. We considered criterion 5 (capture multiple stakeholder perspective) to be met, if the outcomes were considered relevant for at least two stakeholders, based on face validity. It was not easy to match

the outcomes with the ICF (criterion 6). There are no specific ICF codes for absenteeism, work ability, and productivity, but we have assigned these terms to related ICF codes, as detailed above.

Optional criteria: It is not clear which outcome measures can be reliably used in economic analyses [68, 69, 79]. Because sick leave data are the most commonly used [10] we assumed that this outcome meets the optional criterion 7 (use of outcome for cost-effectiveness analysis). Finally, our assumption that all outcomes can be transferred to different insurance schemes (criterion 8) seems plausible, but this needs further evaluation.

Discussion

Work participation can best be considered as the engagement in a major life area that is important for most persons and as discharging the worker role. The ICF is a leading framework in defining work functioning, activities and participation, and its counterpart work disability. Terminology of outcomes require critical attention because standardization is lacking. There is no classification of outcomes available that fulfills multiple criteria for a COS on work participation. In our framework we propose four comprehensive work participation stages that help to select work outcomes: (1) initiating employment, (2) having employment, (3) increasing or maintaining productivity at work and (4) return to employment.

The studies included in this paper contain theories and findings on what is important to consider for the assessment of work-participation in general [5, 14, 20, 26, 31, 34, 46, 48, 51–53, 76, 102], and in some cases specifically for an outcome category, such as productivity or sick leave [65, 67]. Theories describing the general work-participation process mention a broad range of factors which could be relevant to include in studies which measure improvements in work participation. However, no clear prioritization is indicated on the level of outcomes and consideration of the temporal aspect is often lacking.

We evaluated theories and studies based on empirical findings on what is currently considered as relevant for the assessment of work participation. Our proposed framework is novel in terms of structuring the work participation process on the level of most critical outcomes,

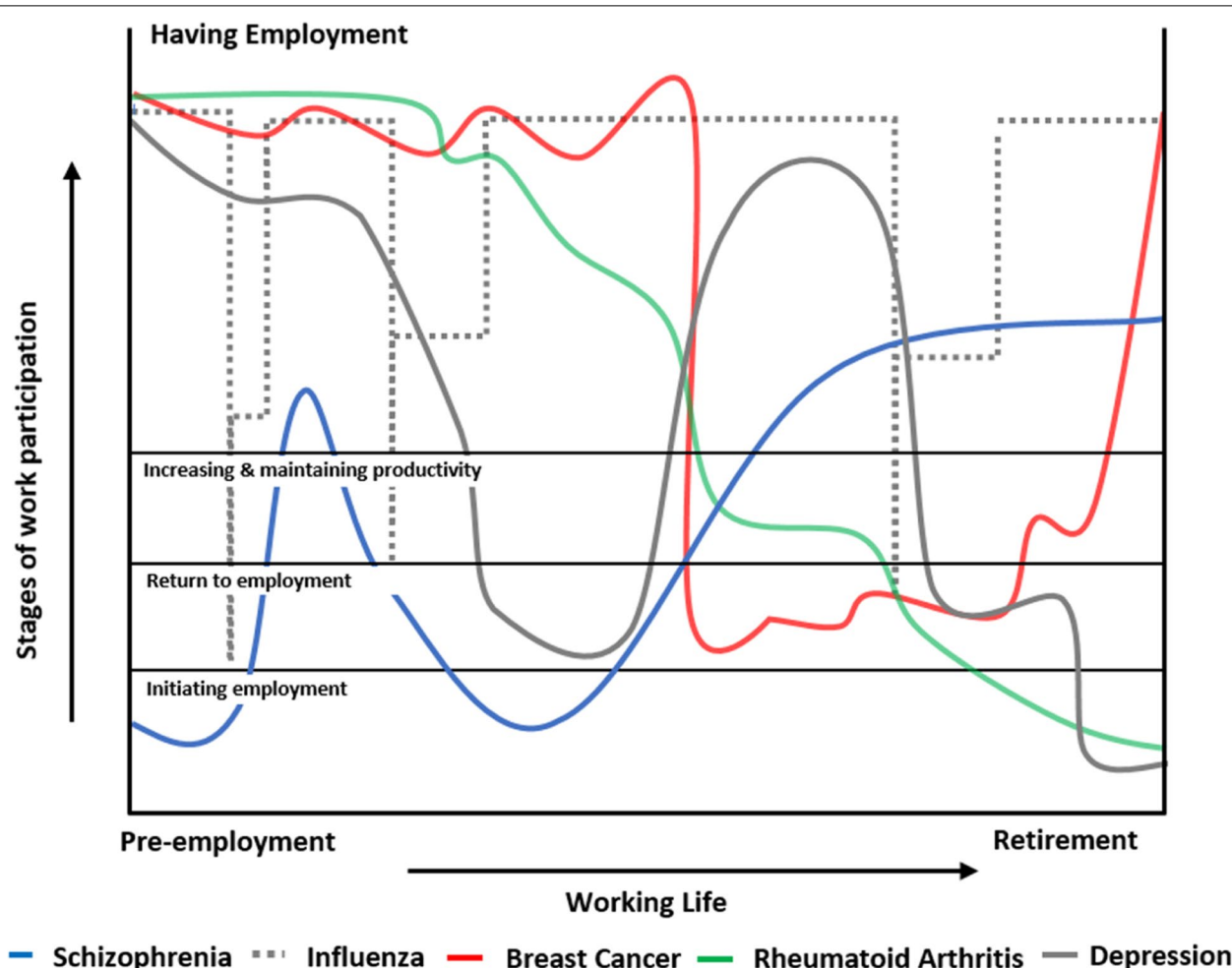


Fig. 2 Possible work participation trajectories with the y-axis indicating the severity of disruption of work participation and the x-axis indicating time from start to end of working life. The health problem that affects the worker is an important indicator of how people move through the four stages of work participation during their working life. Influenza hardly influences work participation but schizophrenia severely disrupts work participation

including the temporal aspect of various disease courses and progression within the different stages of work-participation. Various stakeholder perspectives are important to consider when measuring work participation. However, prioritization of outcomes may vary per stakeholder group [57]. This should be further investigated.

Using the proof of concept approach we applied various disease courses and work participation stages reported in trials with varying aims and showed that work participation outcomes fit within our framework. However, the framework suggests a broader scope of outcomes than what trialists may be used to consider. For example, studies on return to work typically do not include outcomes such as “RtW self-efficacy”. Looking at literature, such an outcome could be considered for a COS as it could be an important indicator of sustainable RtW. Subjective

outcomes are most likely to be under researched and only included in vocational trials [10].

Although we used a sensitive search strategy for our systematic literature review, it is possible that we did not include all theories or frameworks which are also used in research and practice. In addition, our proof of concept is applied to six types of studies which could mean that not all possible outcomes may have been considered. Last, it is difficult to ascertain whether the four stages of work participation are applicable on an international scale because of possible variation of various regulatory approaches across countries. Statutory regulations influence what is prioritized in occupational health in a continuously evolving manner [103] and indirectly dictate definitions and terminology of (work participation) concepts- such as what it means to be (un)employed [104]. A more elaborate analysis of international policy and work

Table 8 Proof of concept for the framework. We applied the COS criteria for outcomes on work participation (Table 3) to the work outcomes used in 6 RCTs with different health conditions and heterogeneous disability trajectories. We compared the extent to which work participation outcomes in RCTs met the 8 COS criteria

Participants; Health condition	Participants; employment status at inclusion	Work participation stage	Intervention	Measured work participation outcomes	Fit with mandatory criteria								Fit with optional criteria	
					1	2	3	4	5	6	7	8		
Schizophrenia [96]	Unemployed	Initiating employment; Having employment	Vocational rehabilitation	-Frequency of job interviews, -Work status, -Worked hours	x	x	x	x	x	x				x
Rheumatoid arthritis [97]	40% employed	Increasing or maintaining productivity at work	Pharmaceutical	-Work productivity	x	x	x	x	x	x				x
Depression [98]	83% employed	Return to employment	Using self-assessment of depression course during GP consultations	-Work ability, —Sick leave, -Time to return to work	x	x	x	x	x	x	x			x
Breast cancer [99]	Unspecified	Return to employment	Post radiation exercise program	-Return to work (sick leave)	x	x	x	x	x	x	x			x
Influenza [100]	100% employed	Return to employment	Vaccination against influenza	-Sick leave	x	x	x	x	x	x	x			x
On sick leave for at least 6 months due to any health problem [101]	Employed	Return to employment	Independent medical evaluation	-Sick leave	x	x	x	x	x	x	x			x

Legend: COS criteria: Mandatory criteria 1: be sensitive to change; 2: be feasible to measure; 3: be applicable internationally; 4: be work participation specific; 5: capture multiple stakeholder perspectives; 6: be in alignment with the ICF model. Optional criteria 7: be used for cost-effectiveness studies; 8: be applicable across different insurance schemes

outcome measurements is needed to show which outcomes categories are equally applicable across countries with different regulatory regulations.

We will build on the proposed stages of work participation, each with distinct and corresponding types of outcomes, for the further development of a COS for Work. This will involve reaching consensus amongst stakeholders on what type of outcomes are essential to be measured for each stage. Consensus will specifically need to focus on unambiguous outcome definitions for measuring: employment status in stage 2, decreased performance on the job in stage 3, sickness absence and RtW in category 4 and if subjective outcomes could be relevant for broad use such as *motivation for work* and *RtW self-efficacy*. Further, clinimetrically sound measurement methods need to be determined for the set of outcomes, ensuring feasibility for international and cross-disciplinary research.

The COS for Work will enable researchers to compare data on a larger scale and draw better conclusions on which interventions are most effective in promoting work participation. Use of COS will also help reduce research waste and assist policy makers and practitioners in making better informed decisions on worthwhile investments.

Concluding remarks

We present a framework for selecting work-participation outcome measurements which will be used for the development of a COS. The framework is presented from the perspective of various stages of the work participation process, and it can be applied to any type of participant population, aim of intervention and by the international community. We propose the following four stages of work participation: (1) initiating employment, (2) having employment, (3) increasing or maintaining productivity at work and (4) return to employment.

Supplementary Information

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Additional file 1: search strategy.

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Study conception and design: all authors; data collection: MR, JV; data analysis: MR, JH, JV; draft manuscript preparation: MR. All authors reviewed the results and approved the final version of the manuscript.

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The authors declare they have no competing interests.

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