Occupational Therapy and Health Economics

A SHORT INTRODUCTION TO HEALTH ECONOMICS AND ECONOMIC EVIDENCE FOR OCCUPATIONAL THERAPY IN THE FIELD OF MENTAL HEALTH DURING WORKING LIFE AND HEALTH OF OLDER PEOPLE.

ergoterapeutene
Toi Toimintaterapeuttiliitto Ergoterapeutförbundet
IÐJUÞJÁLFAFÉLAG ÍSLANDS
SVERIGES ARBETSTERAPEUTER
ERGOTERAPEUT FORENINGEN

Preface

For every society it is important to know if the health care interventions provided are effective and efficient. Resources are limited, and in order to maintain high standards, the resources available need to be allocated to the interventions that give the best results. In the Nordic welfare systems one of the future challenges is that of demographic changes. An increasing number of older people and increased life expectancy will lead to an increasing need of care. At the same time, the decreasing number of younger people will lead to lower numbers of employable people for labour markets and fewer gainfully employed taxpayers. Thus, the need for health economic data that underpins decision-making processes will increase and become more important for policy makers in different parts of our welfare systems. There will be growing demand for knowledge about the effects of and costs for different health care interventions (digital and/or personal).

"Promote awareness and understanding of health economics…"

In general, the effects of occupational therapy interventions are known among professionals and policy makers in the health care sectors. However, knowledge about economical utility of interventions is less known among occupational therapists as well as other professionals, leaders and policy makers. Even though some research is available many occupational therapists sometimes find it difficult to relate and interpret the results to national and organisational contexts.

With this report, we want to promote awareness and understanding of health economics and increase knowledge about economical utility in occupational therapy interventions. We have focused especially on two areas of interest for the Nordic societal debate, i.e. mental health and participation in working life and interventions targeting older people's health. We hope that this report will provide inspiration and contribute to discussions on the economical utility of occupational therapy among occupational therapists, in practice as well as for research.

This report is a result of a project on health economics between the occupational therapy organisations in Denmark, Finland, Iceland, Norway and Sweden. We would like to thank all the researchers who have contributed, especially to those in the project group: *Lisa Gregersen Østergaard* and *Maurits van Tulder* from Aarhus University Hospital and Aarhus University,

"… and increase knowledge about economical utility in occupational therapy interventions"

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Kristina Holmberg, Finland

Ida Kåhlin, Sweden

Thora Leosdottir, Iceland

Nils Erik Ness, Norway

Tina Nør Langager, Denmark

Presidents of the Nordic Associations of Occupational Therapy

Summary

All health care systems have limited resources, so in order to maintain high standards the resources available need to be allocated to interventions that give the best results. Economic evaluation in healthcare provides possibilities for comparing the benefits and costs of different interventions. An economic evaluation systematically assesses both outcome and costs of at least two interventions and produces information on whether or not benefits outweigh costs. By understanding methods used and the results of economic evaluations, occupational therapists can be more critical when evaluating research and discussing innovations, or changes in interventions.

The main aspects of economic evaluation are identifying, measuring, evaluating and comparing the costs and effects of the interventions in focus. There are two main types of economic evaluations: trial-based and model-based. Both types can be used to evaluate cost-effectiveness of occupational therapy interventions. Model-based economic evaluations use different models to estimate the long-term cost-effectiveness, using data from different sources. But, since effectiveness trials are often used as a vehicle for economic evaluations, this report focuses on trial-based economic evaluations.

A trial-based economic evaluation builds on information about the effectiveness of an intervention and may have different perspectives. In an economic evaluation performed from a societal perspective all costs during, and consequences of an intervention are considered, irrespective of who pays for, or benefits. A societal perspective is particularly useful as it provides insight into the effects across all stakeholders and/or sectors. This is important in countries or healthcare systems in which costs may occur in one sector and benefits in other sectors. From a healthcare perspective, only costs accruing in formal healthcare are included in economic evaluations.

Health economic studies must identify and measure the effects of the interventions compared. In cost-effectiveness studies the health outcome is measured with disease specific, or generic assessments. However, in an economic evaluation it is usually hard to interpret health specific outcomes because it is not known what decision makers are willing to pay for improvements. So, cost-utility analyses with generic health outcomes are preferred. The most common generic outcome is often expressed as QUALYS which captures the two most important consequences of an intervention in a single measurement; effects on quantity of life, measured in life years and effect on quality of life expressed in utilities. One advantage of QUALYS is that it provides a general index score, allowing comparison of consequences of a range of interventions for different health issues. In economic evaluations, costs are expressed in monetary units. For this, relevant resource use categories should be identified, measured, and given values in monetary units.

The outcome of cost-effectiveness and cost-utility analyses is expressed as an incremental cost effectiveness ratio (ICER). ICER indicates the additional costs of an intervention in comparison with another intervention per unit of effect gained e.g. 5,000 Euros per QUALY.

Our two literature reviews concern two major areas of interest for Nordic societal debate: Return to work is a systematic review aimed at examining scientific evidence for cost-effectiveness of return to work (RTW) interventions that occupational therapists may use, targeting people with mental health disorders. Older people and health is a scoping review of health economic perspectives in occupational therapy interventions for older people. In both reviews, articles eligible for inclusion had to focus both on health economic evaluation and comparison to no treatment, standard care, or other intervention (also called comparator). Occupational therapy (OT) interventions could be a single intervention or part of multi-professional (MP) interventions in which occupational therapy was a significant part.

Return to work, included articles in which the target group was persons, 18-67 years of age, with mental health disorders, who were on sick leave, employed or unemployed. Studies on people who had different mental health disorders, and people referred to as having a psychiatric disability or severe mental illness were included. The final number of articles meeting the inclusion criteria was six. Five studies concerned various models of supported employment (IPS). One study explicitly included a work-focused OT intervention added to traditional out-patient treatment for depression. The results show that evidence-based SE IPS intervention is cost-effective in several welfare systems, among them the Nordic countries. In all studies included SE IPS had greater effects than the comparator. In two of the studies SE IPS had higher costs than treatment as usual, in one study there were no differences in costs and in two studies costs were lower. The study in which a work-focused OT intervention was added to treatment as usual, showed the intervention to be more cost-effective than the comparator, but was considered to have low methodological quality.

The Older people and health review included articles in which the target group was older people, mean age ≥60 years. Of the 35 articles included in the review, 16 concerned OT interventions and 19 MP interventions. Of these, 9 OT interventions and 10 MP interventions were considered to be more cost-effective than comparators. Thus, occupational therapy interventions have potential to positively affect health outcomes such as performance of daily activities, involvement in valued life situations and supporting older people to remain independent. Given the broad array of the interventions, the actual content of interventions varied substantially. The interventions varied from a one-session intervention to those including a large number of sessions over a period of up to nine months. While each each

intervention can be discussed separately in relation to content and outcome, an overarching question is how extensive an intervention needs to be in order to give sufficient effects.

The reviews showed that occupational therapy interventions do have economic implications since, disability, dependency, and work absence impact societal costs. It is, therefore, important that the profession continues to engage in economic evaluations and use results thereof. For future economic evaluation in occupational therapy, researchers need to pay considerable attention to study design, collecting all relevant data on both costs and effects, following costs and effects over a sufficient period of time and ensuring that studies are statistically powered to detect differences in both costs and effects.

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1. Economic evaluation and when to use it?

Economic evaluation in health care provides possibilities for comparing the benefits and costs of different interventions. An economic evaluation systematically assesses both outcome and costs of at least two interventions and produces information on whether or not the benefits outweigh the costs[1]. The main aspects of any economic evaluation are to identify, measure, evaluate and compare the costs and effects of the interventions in focus.

In recent decades, economic evaluation have gained wide acceptance and are increasingly used to support decisions on whether or not to include an intervention in public health care systems and/or reimbursement decisions. The rationale of economic evaluation is that resources are limited and can only be used once. Efficient spending of limited resources is therefore of utmost importance to ensure that benefits are optimal. Decision makers must choose what to spend and how to allocate resources because allocating for one purpose may hinder allocation for other purposes. Economic evaluations help decision makers in making well-informed decisions[2].

There are two main types of economic evaluations: Trial-based economic evaluations and model-based economic evaluations.

- A trial-based economic evaluation is conducted alongside a clinical trial
- A model-based economic evaluation is mainly used to evaluate long-term consequences or to compare multiple interventions

Both trial-based and model-based economic evaluations can be performed in order to evaluate the cost-effectiveness of occupational therapy interventions. However, they require different approaches.

In model-based economic evaluation different models can be used to estimate the long-term cost-effectiveness using data from different sources. In model-based evaluation different scenarios can be used to estimate the potential consequences of an intervention. Based on the probabilities for different outcomes (e.g. changed health states) to occur, the costs and quality of life related to these outcomes are assigned in order to evaluate the cost-effectiveness of an intervention[1].

One example of such a study is that of Zingmark et al.[3] in which the cost-effectiveness of an intervention implemented to reduce a bathing disability for older people was explored. Inability to wash one´s whole body – bathing disability – among older people has implications for their functioning and quality of life. The aim of Zingmark´s study was to evaluate the long-term cost effectiveness of an intervention targeting bathing disability among older people compared with no intervention. In an economic

evaluation using data from a cohort study the transitions between states of dependency for elderly persons bathing disability, transitions between states of dependency were modeled over eight years. The effect of the intervention, based on previously published trials, was estimated as a 1.4 increased probability of recovery during the first year. The intervention was dominant, the results showed more Quality Adjusted Life Years (QALYs) gained and reduced societal cost compared with no intervention. After eight years, a clinically relevant average improvements in QALYs (.05 QALYs) and reduced societal costs (-€2410) were found in favor of the intervention. The authors concluded that the intervention targeting bathing disability among older people was a cost-effective use of resources[3].

As effectiveness trials are often used as a vehicle for economic evaluations, in this chapter we focus on trial-based economic evaluations. A trial-based economic evaluation often builds on information from a trial on the effectiveness of an intervention.

1.1 Different types of trial-based economic evaluation

There are four types of trial-based economic evaluations and the main difference is the way the key outcome is measured[1].

- Cost-effectiveness analysis (CEA): Costs are measured in monetary units, whereas the consequences are measured in health outcomes.
- Cost-utility analysis (CUA): Costs are measured in monetary units, whereas the key outcome is utility.
- Cost-benefit analysis (CBA): Both costs and consequences are measured in monetary units. CBA is sometimes described as return-on-investment analysis.
- Cost-minimization analysis (CMA): Only costs are considered, as it is assumed that effects are equal. CMAs are considered inappropriate if there is uncertainty regarding a possible difference in effect between interventions. As a difference in effect is usually expected: this being the reason for conducting a clinical trial, CMAs are rarely useful and not recommended[4]. So, CMAs will not be discussed further in this chapter.

1.2 Design of trial-based economic evaluations

Perspective, time horizon, discounting

The *perspective* from which the analysis is being conducted is an essential aspect of an economic evaluation. Perspective refers to the "point of view" that is taken to identify which costs and consequences are relevant and need to be included in the economic evaluation. The two most commonly used perspectives in the field of Occupational Therapy are the societal perspective and the healthcare perspective[5].

In economic evaluations performed from a societal perspective all costs and consequences related to the intervention under study are considered, irrespective of who pays for or benefits from them: client, care provider, or society. A societal perspective is particularly useful as it provides insight into the effects across all stakeholders and/or sectors. This is especially important in countries or healthcare systems in which costs may be accrued in one sector and benefits in other sectors (common in the Nordic countries). For example, costs in the healthcare sector may increase by providing an intervention to absent workers, but this may lead to a decrease of costs in the social sector if the intervention is successful in reducing work absenteeism[6]. From a healthcare perspective, only costs accruing in the formal healthcare perspective are included in economic evaluations. Over the counter medication or assistive devices bought by the clients themselves are for instance not included.

The *time horizon* of an economic evaluation needs to include the entire period over which costs and consequences of an intervention are expected to occur. If the time horizon is more than one year, discounting should be used to adjust for costs and benefits occurring at different points in time as a Krona or a Euro in one year does not have the same value the next or following years. Discounting is important because individuals and society tend to postpone costs to the future, while benefits are preferred to be taken as occurring immediately[1]. Discounting adjusts for preferences for when to incur costs and receive benefits. The rate at which costs and effects are discounted differs across countries. In Scandinavian countries a discount rate of 3 % is often used.

Identifying and measuring effects

An economic evaluation includes costs and effects. The choice of the most appropriate health outcome used in an economic evaluation depends on the nature of the interventions being compared, the disease/disorder, and the perspective used.

Health specific outcomes

In the field of occupational therapy, commonly used outcome measures are occupational performance, mental functioning, and disease specific quality of life. The primary outcome of a clinical trial is usually used as the primary outcome for a cost-effectiveness analysis.

The health outcome measures to be used in a cost-effectiveness analysis are often disease-specific outcomes or generic outcomes. When evaluating effectiveness of occupational therapy interventions, the health outcome may be occupational performance including return to usual daily activities or improved performance of a client´s daily activities that he/she needs to perform and/or wants to perform. This could include maintaining or returning to work, reduced weeks of sick leave, improved independency and/or improved quality of occupational performance. Such measures

could be included in the cost-effectiveness evaluation. When doing so, the results of an economic evaluation are usually hard to interpret because it is unknown what decision-makers are willing to pay for improvements arising from from such outcomes.

To illustrate; in an ongoing study comparing a home-based Occupational Therapy intervention in Denmark (The Cancer Home-Life Intervention) with usual care in palliative rehabilitation of cancer patients, the main clinical outcome was quality of occupational performance measured by the Assessment of Motor and Process Skills (AMPS)[7]. AMPS is used as the outcome measure in the cost-effectiveness analysis in order to estimate the cost per point improvement on the AMPS scales. It will however, be difficult to decide whether or not the occupational therapy intervention will be cost-effective, as it is unknown whether decision-makers are willing to pay, for example 500 or 15 000 Euros per point improvement on the AMPS scale. Therefore, a cost-utility evaluation will be performed[7], in which the key outcome is measured in utility weighted units, generally known as QALYs.

Generic outcomes

A cost-utility analysis is usually the preferred type of economic evaluation when evaluating new interventions[1]. In cost-utility analyses, generic health status is the main outcome, often expressed as QALYs. In cost-utility analyses, QALYs capture the two most important consequences of an intervention in a single measure: its effect on quantity of life, measured in terms of life years and its effect on quality of life expressed in terms of utilities.

Utilities are preference weights, indicating how a person values or desires a certain state of health on a scale ranging from 0 (equal to death) to 1 (equal to full health). The Euroqol-5 dimensions-5 level (EQ-5D-5L) scale is frequently used for estimating utilities[8]. First, the EQ-5D-5L is utilized to assess a client's health state. The instrument is based on self-assessment in which clients rate their current health status. Their health states are described using five health dimensions (i.e. mobility, self-care, usual activities, pain/discomfort and anxiety/depression), all of which contain five severity levels (i.e. no problems, slight problems, moderate problems, severe problems and extreme problems). In the second step, clients' EQ-5D-5L health states are converted into utility scores using country-specific tariffs[8]. Another measure that can also be used to assess utility (QALY) is the Short Form 6-Dimension (SF-6D), which has been developed as a result of Brazier et al.'s restructuring of the Short Form 36 Dimension (SF-36) which measures general health status[9].

A cost-utility analysis expresses the effect as utility; the value of a specific health state. Utilities are usually expressed in quality-adjusted life years (QALY). The use of QALY allows computation of gains from both redu-

ced morbidity and mortality over time[1]. One advantage of QALYs is that they provide a general index score that allows decision-makers to compare the consequences of a range of interventions for different health issues. For example, the National Institute for Health and Clinical Excellence (NICE) in the UK has set an upper threshold for reimbursement approval for procedures of GBP 30.000 per QALY gained[10].

Identifying, measuring and pricing costs

In economic evaluations, costs are expressed in monetary units. For this purpose, relevant resource use categories should be identified, measured, and given value. Commonly used categories of resource use in the field of OT are the costs of the interventions under study, the costs of other health care utilization (including for example medication, assistive devices, and home care), clients and family costs, and the costs of productivity losses[1].

Costing of relevant resource use categories generally involves three steps; 1) measurement of quantities of resources consumed; 2) assignment of unit prices; and 3) pricing of resources consumed found by multiplying quantities by respective unit prices. After relevant resource use categories have been identified and measured, researchers should determine how to price them. Unit prices are used to give value to resource use; these should reflect so-called opportunity costs defined as "the value of a resource in its most highly valued alternative use". Market prices and tariffs are often inaccurate measures of the real value of a diagnostic test or instrument, a drug, or a therapeutic intervention or device.

Costs of interventions

Costs of interventions are often based on a bottom-up micro-costing approach, in which detailed data regarding the quantities of resources consumed as well as their unit prices are collected separately per intervention component. Such resources may include intervention staff hours, materials used, overhead activities, office space, and transport. In OT interventions the time used by the OT, both with and away from a client, needs to be measured in order to set the price for the time used. If aids or appliances are used in interventions these need to be measured and priced.

To price healthcare utilization, unit prices may be estimated using a micro-costing approach. Micro-costing allows for a precise assessment of the economic costs of health interventions and is especially useful in economic evaluations of new interventions. For interventions with a large variability across providers, and for estimating the true costs of an intervention this is important if the intervention is to be implemented in the long term. If micro-costing is not feasible, information on the market price of an intervention may be derived from vendors, companies or research project records.

Costs of health care utilization

Ideally, all healthcare services provided for each client in a study are

measured to reduce the likelihood of shifts in healthcare utilization rates being missed. This approach increases the validity of the results but may not always be feasible. Alternatively, data collection could be limited to all healthcare services that are related to the disease or disorder under study. However, it is often difficult to decide which healthcare services are, or are not, related to a specific disease or disorder. This is especially true when evaluating interventions aimed at chronic disorders in which clients usually have multiple co-morbidities. In all cases, it is important to ensure inclusion of all of the healthcare services that generate the highest costs. For example, in occupational therapy home care (public and private) may be one of the highest types of costs.

Costs of healthcare utilization are usually not directly measured but are estimated based on information on use of resources. Which categories of resource use are relevant in a specific economic evaluation depends on the perspective applied. Data on healthcare resource use is ideally collected prospectively alongside an effectiveness trial or extracted from insurance or hospital databases, or national registries. Databases, however, may not always contain all data required, and should only be used if their validity and reliability is high. When collecting self-assessed resource use data by means of retrospective questionnaires or prospective diaries, researchers must consider both recall bias and completeness of information. Longer recall periods (longer than 2 months) increases the risk of clients forgetting important information. Relatively short recall periods (shorter than 2 months) over a longer period of time (for example, a study with one- or two-year follow-up) may be too burdensome on clients, consequently, increasing the risk of missing data and drop-outs. Using 2- to 3-month recall periods is suggested in trials with a long-term follow-up of 12 months or more. This will maximize completeness at the cost of some recall bias.

Micro-costing, predefined price weights, prices according to professional organizations, or tariffs are used to estimate costs[1]. In most economic evaluations several methods are used simultaneously. In the example on page 15, costings of the intervention costs were calculated using micro-costing, fixed prices were used to estimate the costs of the professionals and age and gender matched wages or salaries were used to estimate the costs of client time.

Costs to client and family

Costs to clients and family are important in economic evaluations in the field of OT. Examples of clients' costs are co-payments where the client has to pay a part of the cost of the treatment, the cost of over-the-counter medication, assistive devices (including assistive digital technology) and costs related to travelling to or time used in an intervention[1]. Also it is considered highly relevant to measure costs of informal care as this may be associated with high costs[11]. Informal care includes the time that spouses, family or others spend on caring for a person with a chronic disorder/disability.

Example of costing in a cost-effectiveness study

A Danish study evaluated the effectiveness and cost-effectiveness of a cognitive-behavioral therapy (CBT) intervention with a focus on handling everyday life for clients undergoing a lumbar spinal fusion[16, 17]. The CBT intervention consisted of six sessions. The intervention was multidisciplinary with an occupational therapist and a psychologist as the primary teachers and coaches[18]. The study design was a randomized clinical trial (RCT) with a follow-up of one year and an economic evaluation alongside[16,17]. In this study, a societal perspective was applied; all costs of activity and resource use related to the clients' participation in the rehabilitation program were included. These included intervention costs, primary and secondary health care costs, medication costs, productivity loss and clients' costs including formal care.

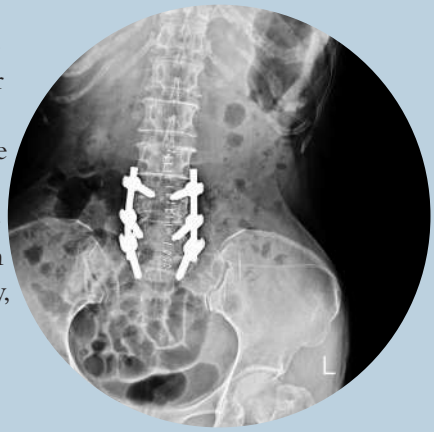
The cost of the intervention was estimated using micro-costing. This was done by including: a) Time for educating staff, b) Number of hours used by staff to deliver the intervention (including administrating time), c) costs of educational materials (e.g. manuals). The hours were multiplied by the gross salaries for the staff involved.

The cost of rehabilitation was included in the cost of surgery, in accordance with the current Diagnosis-Related-Grouping (DRG) reimbursement rate in Denmark. The costs for secondary healthcare service were extracted from the Danish National Patient Registry (NPR) using associated DRG rates. The NPR contains data on all somatic hospital admissions since 1977 as well as data on outpatient and emergency visits since 1995[19].

The costs of utilization of primary health care, including contacts with general practitioners, medical specialists and physiotherapists were extracted from The Danish National Health Service Register for Primary Care and calculated using the activity-based rates (number of visits) that are used to reimburse providers.

Productivity costs were calculated using data on the number of weeks of sick leave obtained from the DREAM database. This database includes information on all public transfer payments administered by Danish ministries, municipalities, and Statistics Denmark for all persons domiciled in Denmark on a weekly basis since 1991. The productivity costs per client were calculated using the Human Capital method using age- and gender-matched average gross salaries from Statistics Denmark[20].

Clients' out-of-pocket costs included hours used for the intervention, hours spent on travelling to and from hospital and use of informal care, including help from family and friends. The travel costs were calculated by multiplying the distance travelled (kilometers) by the official Danish mileage allowance. Travel time was calculated by assuming that 1 kilometer took 1 minute. For the time spent in rehabilitation, the duration of each session was used.



Other resource utilization (prescription medication, over-the-counter medication, help from family and friends, home care, domestic help and aids) was assessed on the basis of a Danish version of the Dutch Cost Diary, in which the clients registered such costs each month for one year[21]. The Dutch Cost Diary was developed in the Netherlands and first described in literature in 2000. The diary was developed in order to estimate total resource use, expenses, and lost productivity due to illness and treatment. The diary measures three components: 1. Direct healthcare costs (for example, visits to general practitioner, specialist care, prescriptive medication, physiotherapy); 2. Direct non-healthcare costs (costs incurred by the client and the client's family, such as non-prescriptive medication, paid and unpaid household help, transport costs); and 3. Indirect costs (costs related to absence from work, both paid and unpaid work and days lost from housekeeping and other daily activities). The cost diary was subsequently kept by the clients every month for a total of 12 months.

Usually, these costs are not included in databases and need to be collected through self-reporting diaries or questionnaires. The diary method is considered the gold standard when measuring costs for clients and families. However, the use of cost-diaries can be time consuming so questionnaires may be used instead[11].

Costs of productivity loss

Productivity loss can be defined as the output loss related to reduced labor input. It is impossible to objectively measure the true impact of reduced labor input on a society's output. For example, if a person is employed by different employers e.g. having a clinical position at a hospital or a rehabilitation unit as well as working as a postman and teaching evening classes. It is therefore common to use proxies of productivity loss, often estimated using self-reported data or data from national registers on work absenteeism (i.e. absence due to sickness) and/or presenteeism (i.e. reduced performance while at work). Unpaid productivity losses can also be included in an economic evaluation e.g. voluntary work in society[1]. This is commonly measured using questionnaire-based registrations and given value using fixed hourly rates.

The two main methods for estimating costs of work absenteeism are the Human Capital Approach (HCA) and the Friction Cost Approach (FCA)[12]. Both methods use the number of days absent because of sickness for estimating costs, but the FCA also includes the duration of periods of absence. The difference between the two methods is the way by which absenteeism costs are given value. According to the HCA, absenteeism costs are equal to the amount of income persons would have earned had they not been disabled or ill. The FCA assumes that workers with long-term sickness absence will be replaced by an unemployed person and that production losses occur only during the period organizations need to replace a sick worker. This period is called the friction period[12].

Presenteeism is becoming increasingly included as part of productivity loss. Several instruments are available for measuring presenteeism, usually as work performance in terms of points, percentages, or proportions that can be used to estimate the total number of working days lost due to presenteeism. Presenteeism data is not available from national registers.

1.3 Statistical analysis

Health economic evaluations are analyzed using different statistical methods[16]. In this report we have focused on analyses of cost-effectiveness and cost-utility as they are the ones most commonly used. In health economics evaluations different statistical methods can be used.

Handling missing data

In economic evaluations alongside randomized controlled trials, in which data is prospectively collected, it cannot be avoided that some data is missing. If this is the case it is relevant to use methods to get the best

possible estimate thereof[13]. If the amount of missing data is small (<5%), complete-case analyses may be considered. However, if the amount of data missing is greater than 5% replacing missing data with substituted value is is recommended as this is considered to lead to more accurate results than would be the case if no estimates of the missing data were made. This is called imputation for which different techniques may be used[13]. However, even if state of the art techniques are used to replace missing data, the estimate will still be less reliable and precise than having a complete data-set. In economic evaluations, every effort should be made to minimize the amount of missing data[14]. This can be done by optimizing registration of resource use and only collecting information that cannot be extracted from national registers.

Handling skewed data

Cost data is often skewed and usually consists of only a small proportion of clients with high costs and a large proportion with relatively low costs, i.e. the costs are not evenly distributed over the sample. Also, costs are never lower than zero. The standard approach for dealing with skewed data is to provide a summary measure of the distribution in the form of a median[15]. However, this is inappropriate for cost data as decision makers need to be able to estimate the total cost of implementing a new intervention (total implementation costs = mean costs per participant * number of participants). To calculate the total cost when data is skewed, different methods can be used[15].

Analysis of cost-effectiveness and cost-utility

In cost-effectiveness and cost-utility analyses, the outcome is expressed as an incremental cost-effectiveness ratio (ICER)[1]. The ICER indicates the additional costs of an intervention in comparison with another intervention per unit of effect gained. For example, 5,000 Euros per QALY gained. The ICER is calculated by dividing the mean difference in cost by the mean difference in effect of two interventions. ICER is a ratio measure, which in some situations may be difficult to interpret. So, to improve interpretation the ICERs are often presented graphically on a cost-effectiveness plane (CE-plane). The CE-plane usually includes the uncertainty factor of the ICER by presenting 5,000 or more so-called 'bootstrapped' ICERs[1] (see Figure 1).

If one intervention is both more effective and more costly than the other intervention it is compared with, the decision as to whether the intervention is considered to be cost-effective or not depends on what is referred to as "willingness-to-pay". "Willingness-to-pay" is the maximum amount of money decision makers are willing to pay for an additional unit of effect (e.g., per life-year saved or per QALY). Since it is often unknown what

Figure 1

Cost-effectiveness plane

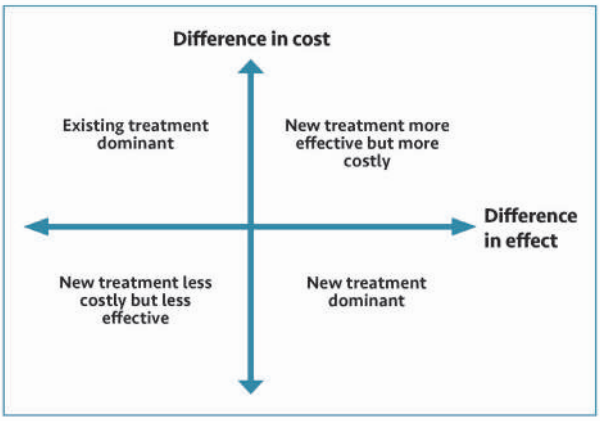
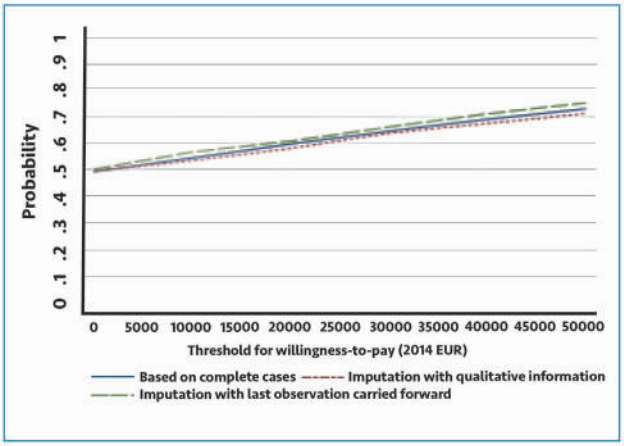


Figure 2

Example of Cost-effect Acceptability Curve from the study by Rolving et al., 2016



decision makers are willing to pay for an additional unit of effect, the probability that the intervention is cost-effective compared to other interventions is estimated for a range of thresholds. These values can then be plotted on cost-effectiveness acceptability curves (CEACs), (see Figure 2).

1.4 Final remarks

This brief introduction into health economics will hopefully lead to a better understanding of the methods used, as well as the results of economic evaluations. For decision makers, this is important to enable evidence-based decisions. For researchers this is important to provide valid and reliable information to facilitate well-informed decisions. And for occupational therapists and clients this is important because if cost and effects are being considered, the limited resources are used efficiently and health gains for clients are optimal. This may not necessarily represent a health gain for individual clients, as it refers to overall health gains for society. By understanding the methods of economic evaluations, occupational therapists can be more critical when evaluating research and when arguing about innovations or changes in interventions.

The next two chapters give some examples of economic evaluations in the field of occupational therapy that may hopefully clarify the relevance for the field, provide further knowledge and help to better understand the methods and results of economic evaluations.

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Cost-effectiveness of occupational therapy interventions towards returning to work for persons experiencing mental health disorders – a systematic review:

2. Return to work

2.1 Background

Long-term sick leave due to mental health disorders negatively affects the persons concerned and carries high economic costs for individuals, employers and society. The prevalence of people with common mental disorders among working populations continues to be high, in Sweden, Norway and internationally[1]. Furthermore, sick leave durations are extending among people who already have long periods of sick leave, entailing increased long-term absenteeism from the labour market[2]. The consequences in terms of costs for society mainly comprise of lost productivity due to work absenteeism and in some circumstances unemployment[3]. It is not sufficient just to evaluate the effectiveness of interventions aimed at supporting people to go back to work, it is also important to address whether or not an intervention makes good use of society's limited resources. Researchers have previously reported an increased demand of economic evaluations of effective return-to-work (RTW) and workplace interventions[4, 5]. RTW as a concept addresses both an outcome measure, to start working or acquiring an employment after a sick-leave period and an individual's personal process of going back to work[6, 7].

In public health research workplace interventions are often classified as primary, secondary and tertiary prevention interventions[8]. Primary prevention aims at promoting mental health among workers and assessing risk factors in the workplace, thus aiming to reduce or prevent sick leave. Secondary prevention focuses on workers who risk developing symptoms of ill health or illness. Early treatment, coping strategies and/or stress management may be offered to prevent further symptoms occurring[8]. In tertiary prevention, rehabilitation and RTW support are addressed as essential interventions to support people in returning to work and avoiding recurrent sick leave[8]. However, Joyce and colleagues[8] recently concluded in their meta-review, that single primary, secondary and tertiary prevention interventions from different actors need to be coordinated and implemented as one overall solution, in order to better support a sustainable RTW. Mental health interventions, such as symptom reduction or psychological treatment, should in their opinion be integrated with RTW processes and input at workplaces in order to facilitate access to (re-)employment and lasting working life for people with mental health disorders[5, 8]. This is important as only symptom reduction (e.g. decreased depression severity) does not predict an individual's actual RTW outcome[9]. Evidence has been reported in favour of interventions including several components in combination with workplace contact, foremost for people with stress-related disorders and depression[10]. For persons experiencing schizophrenia,

supported employment using the Individual Placement and Support (SE IPS) model for acquiring employment is evidence-based[11, 12].

Occupational therapists work within various organizations and have a strong tradition in offering vocational rehabilitation services, particularly in secondary and tertiary prevention interventions[13-17]. For instance, occupational therapists can work as part of a multidisciplinary team or as an employment specialist in supported employment interventions[13, 18]. Tools for single interventions, such as work ability related assessments[19] or work environment evaluations[20] can be used in multidisciplinary interventions. In supported employment, the employment specialist is the key person in RTW support, working in accordance with the model's principles and in collaboration with the mental healthcare service, employers and other stakeholders[13, 21]. Despite the long tradition of occupational therapists working in vocational rehabilitation services the evidence base of effective interventions is somewhat limited, especially for people with mental health disorders[22]. Nevertheless, one study evaluating cognitive work hardening, an OT intervention aiming to prepare persons with depression for RTW, showed promising results regarding decreased depression severity, increased subjective work ability and improvement in lowering fatigue[23]. In a recent literature review of interventions occupational therapists may use in dealing with mental health, it was concluded that the SE IPS model was the most effective vocational intervention in terms of acquiring employment[24]. In two other studies, the supported employment Individual Enabling and Support model (SE IES), in which one of the employment specialists was an occupational therapist, showed effectiveness in terms of employment rate, depression severity, and empowerment when compared to traditional vocational training services[14, 25]. There are some indications that different OT interventions can enhance RTW outcomes but the evidence base needs to be improved through more studies of high methodological quality[24].

Economic evidence concerning workplace mental health interventions, focusing on primary prevention, treatment and RTW was reported in a systematic review some years ago, conclusion being that RTW interventions for people with depression were not cost-effective[4]. Studies of cost-effectiveness and OT interventions in mental health are, however, scarce and in need of development[26]. As SE IPS is now widely implemented in mental health and social services as an evidence-based model, it has also been a focus in some of the OT literature. Several authors have highlighted the match between the core principles of SE IPS and the core features of occupational therapy, e.g. working in a person-centred manner following the individual's preferences, as well as the importance for OTs to use evidence-based models in vocational services[13, 27-29]. However, cost-effectiveness of OT interventions in vocational rehabilitation services, including SE IPS models, has not been systematically reviewed. This

systematic review, therefore aims to examine the scientific evidence for cost-effectiveness of RTW interventions targeting people with mental health disorders that OTs may use.

Specific research questions

- What kind of RTW-interventions have been evaluated concerning cost-effectiveness?
- Which target groups of people with mental health disorders are included?
- What results on cost-effectiveness have been reported?
- What kinds of costs have been included in analyses?
- Which outcome measures have been used?
- What kind of intervention was performed in the control group?
- How long was the duration of follow-up?

2.2 Methods

Identification of relevant literature

In order to answer aforementioned questions a systematic search strategy was used. A literature search was initiated in June 2018 and another updated search was performed at the end of October 2018, and in 2019. Peer-reviewed scientific articles published between 1998 and 2019 were included. We used MeSH-terms in combination with free keywords to search through databases including Medline (PubMed) and CINAHL, PsychInfo. The PICO framework (Population, Intervention, Comparator, Outcome) was used in the search strategy to ascertain relevant information[30]. A librarian at Lund University was consulted when conducting the searches. Reference lists of the studies were also scrutinized to find possible additional studies.

Inclusion criteria for studies concerned cost-effectiveness studies of RTW interventions, defined as OT vocational intervention or SE IPS. OT interventions could be a single intervention or part of multidisciplinary team interventions.

For inclusion, studies needed to have been designed as a randomized controlled trial (RCT), or have used a quasi-experimental design in which participants were not randomised, studies in which the intervention was compared to another control intervention not representing the same target group, or studies having a model-based design based on a systematic review. This broader perspective was used as cost-effectiveness studies in the area are rare. Articles needed to have reported a cost-utility, cost-effectiveness, cost-minimization or cost-benefit analysis. Economic evaluations could also have included partial analysis.

When it came to the target group inclusion criteria were persons with mental health disorders who were on sick leave, employed or unemployed,

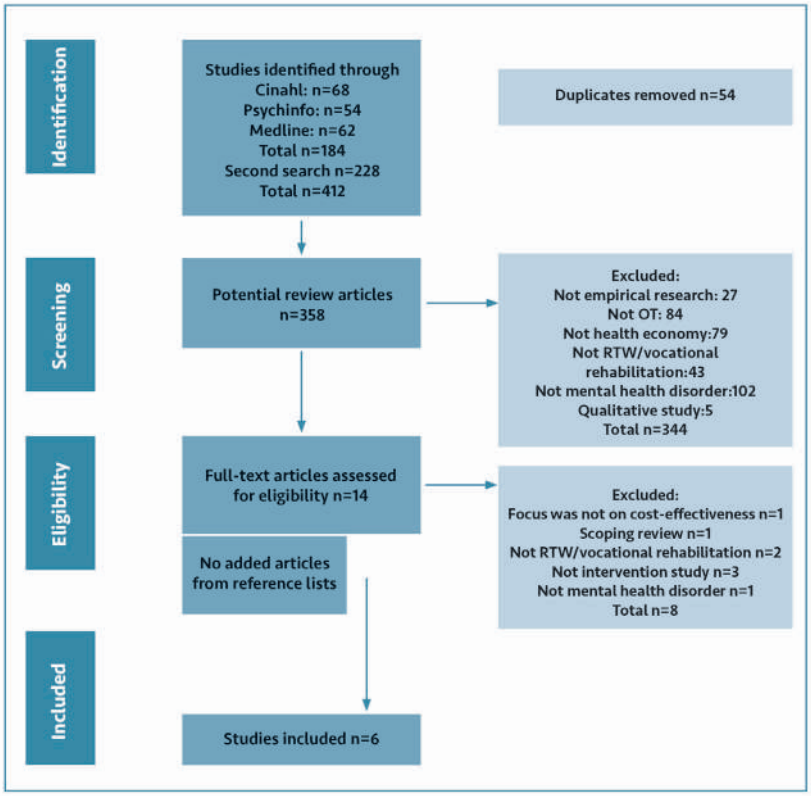
and 18-67 years of age. We included studies on persons who had different mental health disorders, such as depression, anxiety and panic disorder, PTSD and exhaustion disorder (or Common Mental Disorders; CMD), bipolar disorder, schizophrenia or other psychosis, and persons referred to as having a psychiatric disability or severe mental illness.

Selection of articles

First, duplicates were removed. The selection process continued by two reviewers independently of each other reading the titles and abstracts of the list of articles selected and identifying key words. Then, the lists were compared, and a discussion of differences took place until consensus was reached. The articles selected were read in full text by two reviewers and examined for consistency with study criteria. A consensus process was also adopted in this phase and reference lists of the potential articles were checked to identify possible additional studies. A flowchart of the selection process is shown in Figure 1.

Figure 1

Flowchart of study selection



Data extraction and quality assessment

Data of the study characteristics and findings that were extracted included; type of intervention, location, setting, study design, perspective, population, intervention, comparator, health outcome, costs included, time horizon

and cost-effectiveness. To assess the quality of the reported cost-effectiveness in studies, the Consolidated Health Economic Evaluation Reporting Standards (CHEERS), was used[31]. The guidelines include 24 items, divided into five sections and presented as a checklist. CHEERS covers all aspects of a scientific article and how these should be reported. The sections consist of: Title and abstract, Introduction, Methods, Results and Discussion. Each section has sub-criteria which are to be assessed. All the criteria were compiled in a table and each methodological criterion was assessed as *fully*, *partially* or *not reported*. Quality assessment in this systematic review was performed by two independent researchers followed by a consensus discussion. One of the studies included in the review[32] was conducted by the same members of the research group which has written this review. So to avoid bias, other researchers were asked to carry out the quality assessment of this study.

In this review a qualitative description and synthesis of the studies included is presented. When assessing the quality of the articles presented by Knapp and colleagues[33] and Saha and colleagues[32], the original RCT publications[11, 14] were also read.

2.3 Results

After removing duplicates, a total of 358 articles were found in the literature search. The final number of articles meeting the inclusion criteria was six[32-37]. No additional articles were added after reviewing the reference lists nor after updating literature searches. In the articles included the number of participants ranged from 61 to 312; and the studies dating between 2002 and 2018 (Table 1).

One study explicitly included a work-focused OT-intervention, added to traditional out-patient treatment for depression[36]. The other five studies concerned various models of supported employment, using the SE IPS model for persons with severe mental illness, such as schizophrenia[33-35, 37]. One was based on an advanced supported employment model, SE IES, for persons with depression and bipolar disorders[32]. Two studies used cost-benefit analyses[35, 36], one study used cost-utility analysis[32] and the remaining three studies used a cost-effectiveness design[33, 34, 37]. The cost-benefit analysis used by Chalamat and colleagues[35] had a model-based design.

The studies evaluating SE IPS and SE IES, mostly reported the comparator as traditional vocational rehabilitation, which usually involved a graded RTW path in which work ability is assessed and followed by work practice and on-the job training or sheltered work environment[32-35, 37]. The comparator intervention methods were not reported in detail for the various contexts. In the study in which an OT intervention was added to treatment as usual (TAU), the comparison intervention, TAU, involved regular contact (every second or third week) with a psychiatrist and treatment included prescribed medication, cognitive behavioural techniques and psycho-education[36].

Table 1

Characteristics of included studies and cost-effectiveness

Study (authors, year, country)	Health outcomes	Target population	Intervention	Cost-effectiveness
Chalamat et al., 2005 Australia	Employment	People with schizophrenia	Supported Employment, Individual Placement and Support (SE IPS) Employment specialist integrated in mental healthcare service. Individual support according to the principles of IPS.	**Cost-benefit analysis, model-based design** Cost for IPS programme $10.3 M, approximately $8700/patient. Savings: reduced benefits $1.1M, gain; $0.22M income tax. Total net benefit: -$5.6M. Increased income for the individual person. **Result:** The costs are greater than the economic benefit.
Dixon et al., 2002 USA	Competitive employment	People with severe mental illness *n* =150	Supported Employment, Individual Placement and Support (SE IPS). Employment specialist integrated in mental healthcare service. Individual support according to the principles of IPS.	**Cost-effectiveness analysis** More hours and weeks in competitive employment in IPS-group. No statistically significant differences in costs between groups, overall costs were 16 % higher in the IPS group. **Result:** IPS provides more employment and costs more.
Knapp et al., 2013 Netherlands, UK, Italy, Bulgaria, Germany, Switzerland	Additional days worked in competitive employment and percentage of participants working for at least 1 day	People with severe mental health problems *n*=312	Supported Employment, Individual Placement and Support (SE IPS). Employment specialist integrated in mental healthcare service. Individual support according to the principles of IPS.	**Cost-effectiveness analysis, partial cost-benefit analysis** The IPS intervention was more effective than other vocational service regarding vocational outcomes in all sites. IPS was cost-effective, produced better outcomes to a lower health and social service cost in five out of six sites. IPS intervention costs were higher in two sites and lower than comparison groups in four sites. Net benefit in favour of IPS, +£17,005. **Result:** IPS provides more employment and shows a positive net benefit.
Saha et al., 2018 Sweden	QALY based on EQ5D Quality of life (QoL), (MANSA)	People with affective disorders *n*=61	Supported Employment, Individual Enabling and Support (SE IES). Employment specialist integrated in mental healthcare service. Motivational, time-use and cognitive strategies are added to the individual support according to the principles of IES.	**Cost-utility analysis** The IES intervention was more effective than TVR in terms of working hours and quality of life, within group, measured by MANSA. QoL was higher in the IES group but not statistically significant in comparison to TVR, i.e. no difference in QALYs. IES was cost saving: Total net cost IES: 528 Euro, TVR: 7775 Euro. **Result:** IES provides more working hours and is cost saving but there is no significant difference in QUALYs between groups.
Schene et al., 2007 Netherlands	Work resumption, work stress, depression severity	People with major depression *n*=62	Vocational rehabilitation, Occupational therapy added to treatment as usual. Three OT phases, both group and individual sessions regarding occupational history, roleplay, work plan and integration, employer contact, start work.	**Cost-benefit analysis** OT+TAU was more effective in work resumption and hours worked. No differences concerning work stress between groups. Depression decreased more in the TAU group than in the OT+TAU. Total service costs were higher in OT+TAU while mean net benefit in OT+TAU was US$ 14.850 and US$10.898 in TAU. The likelihood of cost-effectiveness of OT+TAU is 75.5% when the value of 1 hour of work is US$36.88. **Result:** OT+TAU provides more work resumption and indicates a positive net benefit.
Yamaguchi et al., 2017 Japan	Employment outcome and work tenure. Cognitive functioning	People with mental illness and low cognitive functioning *n*=111	Supported Employment, Individual Placement and Support and cognitive remediation. Two sessions/week for 12 weeks of cognitive remediation programme including e.g. practising attention, memory, executive functions. Further, 12 group sessions discussing coping strategies, cognitive skills and the importance of performing daily activities. Employment specialist integrated in mental healthcare service. Individual support according to the principles of IPS.	**Cost-effectiveness analysis** Significantly more participants were employed in the Cognitive remediation +IPS group at 12 months. Job tenure was longer in the CR+IPS group and cognitive functioning improved significantly in the CR+IPS group. Total cost CR+IPS: USD 9823. Total cost TVS: USD 11063. No significant difference between groups. Cost of medical services, in-patient costs CR+IPS: USD 560, TVS: USD 3578. Intervention cost CR+IPS: USD 4202, TVS: USD 2915. Cost-effectiveness acceptability curve showed a 70% probability of CR+IPS to be more cost-effective than TVS. **Result:** CR+IPS provides more employment and total costs were equal, while medical service costs were lower in CR+IPS group.

All of the studies included the cost of interventions, although the specific cost items varied in the different studies. Cost for the occupational therapist´s intervention was included in the study by Schene and colleagues[36] and the cost for employment specialists were included in the supported employment studies[32-35, 37]. Healthcare costs were analysed in most of the studies, both in-patient och out-patient costs being included. All studies reported from a healthcare perspective or a combination of social service and healthcare perspectives. Two studies included persons´ and families´ costs.

Included costs

Study (authors, year)	Perspective	Intervention costs and comparator costs	Costs of patient and family	Healthcare utilization costs	Cost of productivity loss	Municipality costs	Time horizon
Chalamat et al., 2005	Healthcare perspective	Cost of employment specialist, cost per contact			Change in government welfare payments (sickness benefits and unemployment benefits), government gain in tax		12 months
Dixon et al., 2002	Healthcare perspective	Vocational service including SE IPS employment specialist, EVR coordinator and cost of rehabilitation service administration		Mental healthcare service costs including inpatient and outpatient service, medication, case management, group and family therapy costs			18 months
Knapp et al., 2013	Healthcare and social service perspective	SE IPS and Usual Vocational Service (UVS) costs		Healthcare service costs including inpatient and outpatient service, care accomodation and medication		Community service and community professions	18 months
Saha et al., 2018	Societal perspective	SE IES intervention costs including cost for employment specialist and estimated costs for TVR			Cost-reduction due to productivity gain		12 months
Schene et al., 2007	Not stated	Occupational therapy intervention cost (OT+TAU), costs for only TAU	Parking and travelling costs	Mental healthcare costs including out-patient treatment and hospitalization, medication and GP costs			12 months
Yamaguchi et al., 2017	Healthcare and social service perspective	Intervention service costs for cognitive remediation and costs for TVS		Healthcare services costs including in- and out-patient and medication costs		Estimated costs from public services. Social services: sheltered workshop, community service and accomodation	12 months

SE IPS=Supported Employment, Individual Placement and Support, EVR= Enhanced Vocational Rehabilitation, UVS= Usual Vocational Service, TVR= Traditional Vocational Rehabilitation, TAU= Treatment as Usual, TVS= Traditional Vocational Service, SE IES= Supported Employment, Individual Enabling and Support.

Table 2

Included costs

Cost-effectiveness

RTW intervention was more effective but had higher costs

In the study by Dixon and colleagues[34] the SE IPS intervention was shown to be more effective in terms of employment rate at 18 months. The overall costs for SE IPS were reported being higher than the costs for the comparator; enhanced vocational rehabilitation (EVR)[34]. The difference was not statistically significant. The ICERs indicated that participating in SE IPS was associated with one additional week of work for which the additional cost compared to the EVR was $283 (each additional hour reported at a value of $13). Further analyses showed estimates that SE IPS

was associated with higher costs but provided more competitive employability. The ICERs for combined earnings (earnings from both competitive and non-competitive employment) also showed a result whereby IPS costs were higher but combined earnings were lower[34].

In the model-based study by Chalamat and colleagues[35], the SE IPS intervention in Australia was estimated to be more effective in terms of employment rate than traditional vocational rehabilitation. But the cost-effectiveness analysis showed that the net benefit of SE IPS was negative as the costs were higher than savings.

RTW intervention was more effective concerning work resumption/employment and had equal costs

In the study in which an OT intervention was added to TAU, effectiveness was shown in terms of increased work resumption, and hours worked compared with TAU only, for persons suffering from major depression. There was no statistically significant difference between groups concerning work stress, depression severity and healthcare costs. This study reported that the OT+TAU intervention had a probability of being 75.5% cost effective in comparison to TAU only, given the value US$36.88 of one hour's work[36].

In the study by Yamaguchi and colleagues[37], a significant difference, in favour of cognitive remediation (CR)+SE IPS, compared with SE IPS only, was found between the groups in respect of employment rate, work tenure and cognitive functioning. There was no significant difference between groups on costs. However, the ICERs costs for the CR+SE IPS intervention was -$29 for employment rate, -$23 for employment tenure and -$387 for cognitive functioning compared to traditional vocational services. Also, the cost-effectiveness probability curves for 1% improvement for persons who worked, indicate that one additional day of work and one-unit improvement in cognitive functioning showed between 70% and 95% likelihood of cost-effectiveness at a threshold value of $20-40[37].

RTW intervention was effective but costs varied due to country specific contexts

In the SE IPS multi-site study[33], the SE IPS model was shown to be more effective in terms of employment and job tenure compared to other vocational services at all sites included in Europe[11]. The in-patient costs for IPS groups decreased during the first 6 months but then diminished and were the same as in the TAU groups at 18 months. Out-patient costs were greater for the IPS group. Total costs were somewhat smaller in the TAU group, but this difference was not significant. Intervention costs for IPS were shown to be higher than TAU in two sites, and less expensive at the four other sites. Reports of incremental cost-effectiveness ratio (ICER)

Table 3

Cost effectiveness

	Larger effects	No difference in effects
Higher costs	Chalamat et al., (2005) Dixon et al., (2002)	
No difference in costs	Schene et al., (2007) Yamaguchi et al., (2017)	
Lower costs	Knapp et al., (2013) Saha et al., (2018)	

indicated that SE IPS dominated over control groups except for one site. For the whole group (all sites) the cost-effectiveness acceptability curves for paying an additional 1% of the persons working for at least an additional day over an 18 months period or for an additional day of work, showed the probability as being nearly equal to 1 at a willingness-to-pay threshold of £0-1000[33].

Quality adjusted life years were equal

The SE IES model was found to be more effective concerning employment rate and job tenure at 12 months compared to one traditional vocational rehabilitation (TVR) group for persons with affective disorders[14]. The model did not show any differences between groups regarding QALYs measured by EQ-5D at 12 months[32]. Quality of life scores measured by Manchester Short Assessment of Quality of Life (MANSA)[38] were significantly improved in the IES group but not in the TVR group[32]. A cost minimization analysis showed that the costs for the IES model per person and year were lower than for the TVR (€7247 lower) when including the productivity gain.

Quality assessment

Two of the six articles met most of the criteria of the CHEERS standards [35, 37]. Two other articles almost met most criteria[33, 34], indicating a high methodological quality for four studies. The two other articles met fewer criteria, and reported partially on several items[32, 36], thus being considered of lower methodological quality. See Table 4.

Table 4

Reporting quality criteria using Consolidated Health Economic Evaluation Reporting Standards (CHEERS)

Authors, year, study	Chalamat et al., 2005, Assessing cost-effectiveness in mental health.	Dixon et al., 2002, Cost-effectiveness of two vocational.	Knapp et al., 2013, Supported employment cost effectiveness.	Saha et al., 2018, Cost-effectiveness of supported employment adapted.	Schene et al., 2007, Adjuvant occupational therapy.	Yamaguchi et al., 2017, Cost-effectiveness of cognitive remediation.
Type of intervention	Supported Employment, Individual Placement and Support (SE IPS)	Supported Employment, Individual Placement and Support (SE IPS)	Supported Employment, Individual Placement and Support, multisite (SE IPS)	Supported Employment, Individual Enabling and Support (SE IES)	Occupational therapy added to treament as usual (OT+TAU)	Supported Employment, Individual Placement and Support added with cognitive remediation (SE IPS+CR)
Total score	19/24 (2)	17/24 (2)	18/24 (2)	15/24 (2)	14/24 (2)	20/24 (2)
Items partially reported	1/24	4/24	3/24	3/24	6/24	1/24

Total score = number of items reported following the CHEERS checklist for each study.
The number of items that were not applicable according to the CHEERS checklist is found in parentheses.
Partially reported = number of items that were partially, but not fully, reported.

2.4 Discussion

As health economic evaluations serve to inform decision makers who are responsible for allocating resources in health care and community organizations, the importance of such evaluations for OT interventions has been profoundly underlined[26]. In this study the cost-effectiveness of RTW interventions that OTs use in mental healthcare services was assessed and compiled. The results of the six studies included indicated cost-effectiveness of RTW interventions in various contexts for persons with mental health disorders. The study by Schene and colleagues[36] in which a work-focused OT intervention combining individual and group based therapy with TAU, was shown to be both effective and cost-effective in terms of increased work resumption and hours worked but not in relation to severity of depression. Thus, the findings were that this type of OT support enhanced the RTW process. The study had, however, a rather small sample size and was considered to have a somewhat low methodological quality[31]. It should be noted that the economic evaluation by Schene and colleagues[36] was published several years before economic evaluation reporting standards were published. Nevertheless, most of the criteria in the CHEERS checklist were seen as being met either fully or partially.

The other studies included concerned supported employment interventions which in terms of RTW outcomes, i.e. acquiring employment are highly evidence-based internationally, for people with mental health disorders[39, 40]. Two of these studies were also published before the statement of CHEERS checklist, but, despite this, most of the checklist items were fully covered. The more recently published studies had high scores on the checklist. Since 2011 SE IPS forms part of the Swedish national guidelines for people with schizophrenia and is a highly recommended intervention for facilitating employment[41]. The guidelines was updated in 2018. The Swedish National Board of Health and Welfare concluded that implementation of SE IPS on a national level would lead to higher costs in the short term but would be cost-saving in the long run[41].

All studies but one used employment of work reseumption as a health outcome. The study by Saha and colleagues[32] used QALY as an outcome, a metric which is widely used to evaluate new interventions when needing to allocate resources in an optimal way[44]. However, no SE IES intervention effect was found regarding QALYs[32]. In addition to the small sample size, concern was also expressed that the EQ-5D questionnaire was not sensitive enough to capture mental health changes in a target group of persons with mental health disorders. This criterion is emphasized in previous health economy literature[45]. Accordingly, it is necessary to use, or develop, relevant outcomes when addressing cost evaluation in similar populations and contexts in RTW research.

In general, the studies in the current review included different costs and outcomes. Unemployment and sick-leave impact a person´s economy, some costs being met by persons and family. So, in economic evaluations, presenting such costs would be highly relevant. Also, as costs for unemployment and sick-leave impact on a society's economy there would be great gains for national economies if more persons on sick-leave returned to work. Given this, the costs of sick-leave and the monetary value of people working also seem to be important items to take into account in economic evaluations of RTW interventions.

The studies taking a societal perspective included costs related to productivity losses, however, they did not include healthcare costs[32, 35]. A Swedish report concluded that in 2008, 60-90% of society´s costs for schizophrenia, depression, bipolar and anxiety disorders come from productivity losses due to long-term sick leave and unemployment[48]. Accordingly, it can be assumed that providing more vocational rehabilitation and return-to-work support lower cost compared to sickness related expenditure would be a cost saving for society as productivity gains would increase. This has been suggested in a primary health-care study in which costs for health-care, rehabilitation and loss of productivity were studied for people on sick leave due to musculoskeletal or mental disorders[49]. In this study, 90% of society´s costs were due to productivity losses, while the provision of rehabilitation interventions represented 3% of the costs[49]. This implies that there should be ample reason to provide more occupational therapy interventions such as the ones studied in the present review. It is, however, still necessary to conduct economic evaluations of RTW interventions that OTs use in practice in order to be able to make a case for the economic benefits arising both for society and individuals.

RTW-interventions such as supported employment may be interpreted as complex interventions since they involve actors and organisations from different authorities acting under diverse government regulations. In addition, there is a long timeframe related to the effects of supported employment. This makes conceptualization of cost evaluation and measurement constructs of such interventions even more difficult. As an illustration, supported employment interventions integrate mental health services, other RTW services as well as employers´ organizations. Thus, it is not merely the choice of framework and outcome standards that will lead to improved evaluations, but also consideration of what complex interventions performed by integrated services requires to enhance political steering and policies. As has been addressed in the UK, it is critical to build bridges between mental health, vocational rehabilitation and financed employment systems in order to improve mental health and employability for persons with mental health disorders and thus provide interventions with substantial savings to national economies[46]. In reflection, focusing on the RTW service arena in which occupational therapists are involved,

as well as being able to conduct fair cost evaluations that points to overall savings both of healthcare use and in monetary terms, new financial systems that are co-commissioned at governmental level need be put forward providing cost benefit feed-backs for all actors involved.

The shortage of economic evaluations of OT interventions in vocational services for people with mental health disorders has been discussed in earlier literature[22] and is confirmed in this review. There have been calls for health economic evaluations in occupational therapy, as well as reports of the need for education and information on how to perform high quality economic evaluations[26,42]. There is an urgent need to provide such evaluations because the lack of OT RTW evaluations makes it difficult for decision makers to discern whether or not it is worth allocating resources for this type of interventions, as discussed by Lambert[43]. It is vital that studies need to focus on the effectiveness of existing OT RTW interventions and methods as well as cost-effectiveness analyses. Furthermore, if OT interventions were to be regularly evaluated, and in the process assessed as being cost-effective, it would increase the demand of occupational therapists in the clinical field.

Limitations

In this review we chose a wide range of search terms concerning vocational rehabilitation services in order to identify OT interventions e.g. SE IPS, evaluated for cost-effectiveness. Most studies did not fit the inclusion criteria or did not concern mental health disorders or health economy. Despite using the aforementioned wide range, studies may exist that have not been identified. CHEERS[31], the quality assessment, was publised rather recently (2013) and some of the studies identified were published before that. However, two of the studies which were published before 2013[34,35] were still considered to have fair or good quality according to the CHEERS checklist.

The choice of including supported employment studies in this review was based on previous research, showing that OTs often take on the leading role in this type of multi-professional intervention[13, 47]. Supported employment is considered to be an evidence-based intervention by OTs[24, 47] as well as for other professionals[41].

Also, occupational therapists are used to incorporating IPS in clinical practice[48]. They have specialized skills and a long tradition of assessing and supporting enhancement of work performance in relation to work-environmental conditions meaning that they (OTs) facilitate the match between work tasks and environment, in accordance with disability and occupational therapy models[49]. Thus most dissertations in Sweden on supported employment for persons with mental health problems has been conducted by occupational therapists[48-52].

2.5 Conclusions

The results show that the evidence-based SE IPS intervention is reported as being cost-effective in several welfare systems. The work-focused OT intervention which was added to TAU, showed effectiveness in work resumption, but did not show any statistical significant result of differences in costs, compared with standard treatment.

This review confirms earlier studies reporting on the need for health economic evaluations regarding OT interventions. It is vital for the profession to be able to argue for OT interventions and convince policy makers of their value. However, it is not only economic research that is needed. It is also urgent that future research on the effectiveness of OT interventions describes the content of interventions more precisely in order to be able to show which components are effective[22]. This becomes particularly important as OTs continue to implement evidence-based interventions in their work, not least when in multidisciplinary teams when combined interventions need to be integrated and have focus on RTW and workplaces.

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Health economic perspectives in occupational therapy interventions for older people – a scoping review:

3. Older people and health

3.1 Introduction

Continued engagement in meaningful occupation constitutes the core of active and healthy ageing both in how it has been defined in policies[1, 2], as well as expressed by older people themselves[3]. Existing evidence provides support for the assumption that being engaged in occupations is associated to positive effects on various health outcomes[4-6]. There is also evidence showing the effectiveness of occupational therapy interventions for older people on a range of outcomes e.g., instrumental activities of daily living (IADL)[7], health management[8] and social participation[9]. While these reviews provide support that occupational therapy interventions for older people result in positive effects, the knowledge related to economic consequences is limited. Potentially, interventions resulting in positive health effects may also affect other care-related resources and costs, such as the need for support in activities of daily living (ADL). Health economic evaluations can therefore add important knowledge on the value and importance of occupational therapy[10].

To date, three reviews of health economic evaluations of occupational therapy for older people have been conducted[11-13] including, in total, eighteen unique studies. Eleven of these considered both costs and health effects. However, few of the studies, in earlier reviews are reported as having high scientific quality[13]. In general, the studies included were characterized by heterogeneity in regard of methods used, the costs included, viewpoints for analyses, interventions included, and populations. Thus, comparisons between different studies are difficult, leading to limited knowledge for decision makers as well as for occupational therapists. Though some published studies indicate that occupational therapy is cost effective[14, 15], additional economic studies on occupational therapy for older people are needed in order to to build a stronger evidence base.

One way of increasing our current knowledge base is by using a broader approach in reviewing existing literature. Scoping reviews have been suggested as a method to disseminate research findings and provide an overview of the knowledge that exists for decision making both for occupational therapists and decision makers[16]. The purpose of the following scoping review was to summarize the knowledge existing in respect of health economic evaluation of occupational therapy interventions targeting older people.

3.2 Methods

The study followed the methodological steps for scoping reviews described in the Arksey and O'Malley's framework[16]. This consists of five steps:

- identifying research question
- identifying relevant studies
- selecting studies
- charting data
- collating, summarizing and reporting the results.

Identifying the research question

In order to summarize the knowledge that exists regarding health economic evaluations of occupational therapy interventions for older people, eight research questions were formulated based on selected items from the CHEERS statement[17], for more information see also page 25. The items selected from the CHEERS statement were chosen since they were deemed to be the most important for describing the type of intervention that had been conducted, for which populations, by which methods and the results[8].

The research questions to be investigated were:

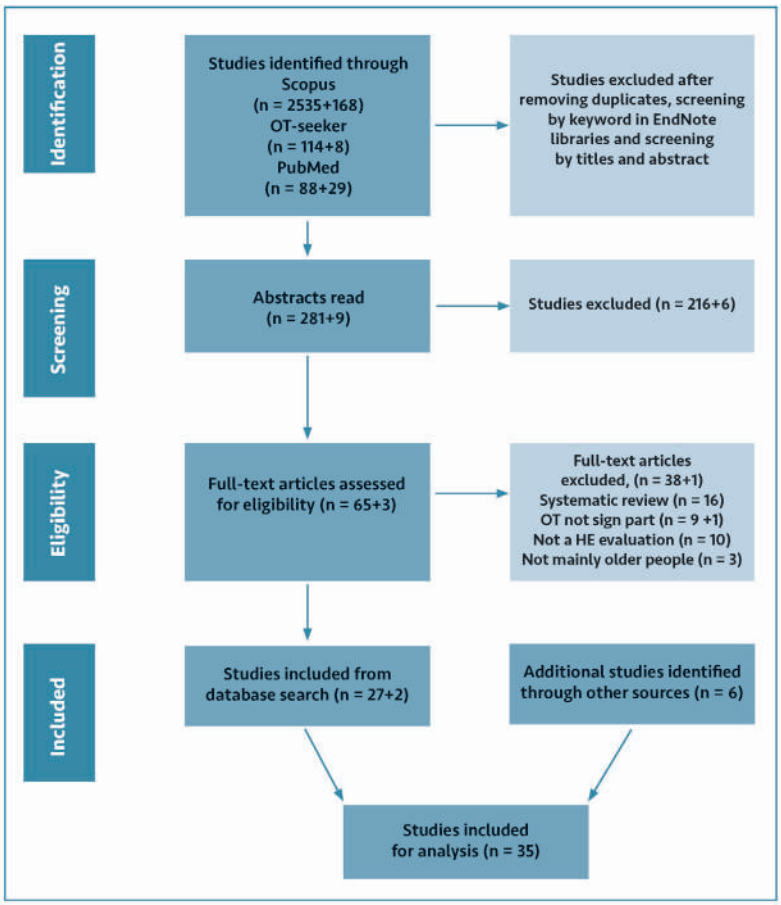
1. For which target populations have health economic evaluations been conducted?
2. Which type of interventions have been evaluated?
3. In relation to which comparators have interventions been evaluated?
4. What was the time horizon of evaluations?
5. Which health outcomes have been used?
6. From which perspective (e.g., societal, provider) have studies been conducted?
7. Which costs have been included in the analysis?
8. Have interventions been cost effective?

Identifying and selecting relevant studies

The eligible sample consisted of scientific publications in English including samples concerning older people (mean age ≥60), evaluating occupational therapy (OT) interventions or multi-professional (MP) interventions in which occupational therapy was a significant part. Eligible studies had to have had focus on health economic evaluation (i.e., both costs and effects were considered) in relation to a comparator (i.e., no treatment, standard care or another intervention). No limits were set regarding publication year or study design. Exclusion criteria were study protocols, conference proceeding, short communications (e.g., commentary) and systematic reviews.

Figure 1

Study selection according to Prisma flowchart



Three databases, Scopus, OT-seeker, PubMed, were searched in February 2018 and an updating search was performed in March 2019. A librarian at Umeå University, Sweden, was consulted in designing a broad search strategy and performing the searches. Different search terms were combined including (1) trials (e.g., clinical, randomized controlled), (2) health economic terms (e.g., cost benefit, cost effectiveness, economic evaluation, (3) occupational therapy, (4) outcomes (e.g., quality of life, activities of daily living, physical function), and (5) older people (e.g., age, senior).

Studies to be included in the analysis were selected in a process whereby duplicates were eliminated and records including obviously non-relevant keywords (e.g., child, adolescent, work environment) were excluded through screening by keyword in titles and abstracts in EndNote. In the following steps, 290 abstracts were looked at, leading to those not clearly meeting criteria being excluded; resulting in 68 studies being read in full text. For all full texts selected, reference lists were scrutinized in order to identify potential references. In addition, previously published systematic reviews were read to ensure that relevant studies were not missed. After further selection excluding studies not meeting the inclusion criteria, 35 studies were included for analysis (Figure 1).

Charting data

In relation to the research questions posed, data was charted in relation to the eight items selected from the CHEERS statement[17]: Target group, intervention content, comparator, time horizon, health outcome, study perspective, identified costs and cost effectiveness. Reporting follows the PRISMA-ScR checklist (Preferred Reporting Items for Systematic reviews and Meta-Analysis extension for Scoping Reviews)[18].

3.3 Results

In all, 16 studies including OT interventions and 19 studies including MP interventions were identified. All references are listed in Appendix, page 58. A summary of study characteristics is presented in Table 1. Thirty-three studies were based on a randomized controlled trial whereas two studies

were model based. Cost effectiveness of the studies included is shown in Tables 2 and 3. Geographically, the studies were conducted in the UK (*n*=14), Australia (*n*=4), USA (*n*=4), Netherlands (*n*=4), Canada (*n*=2), Sweden (*n*=2), Japan (*n*=2), Norway (*n*=1) and New Zealand (n=1). Results related to each research question are presented in the following sections.

Target populations

The target populations of older people within the studies included varied, Table 1. For example regarding age, almost all studies applied an age limit and included persons of that age and above e.g., 65+ (15, 19), 75+[20, 21]. Two studies included persons within a fixed age-span, e.g., 77-82 years[22], 65-90 years[23]. Other ways of defining the target group was in relation to diagnosis (e.g., osteoarthritis, a history of stroke) or level of functioning (e.g., independently-living persons, persons newly referred to home care services), Appendix. In all, the studies included a total of 9926 persons, numbers varying from 46[24] to 1042[25].

Table 1

Summary of study characteristics

	OT interventions (n=16)	Multi-professional interventions (n=19)
Study perspective		
Societal	11	12
Service provider	2	7
Caregiver	1	
Not stated	2	
Costs included		
Intervention	3	1
Intervention and health care	2	4
Intervention, health care and private costs/informal care	1	1
Intervention and social care		1
Intervention, health care and social care	5	4
Intervention, health care, social care and private cost/informal care	4	8
Intervention, health care, social care, private cost/informal care and productivity	1	
No of sessions /contacts*		
≤3	5	2
4-9	4	7
≥10	6	7
Comparator		
No intervention or usual care	12	17
Alternative intervention	2	2
More than one comparator	2	
Time-horizon**		
≤6 months	7	6
7-11 months	1	3
≥12 months	8	10
Health outcome		
QALYs	10	8
ADL	1	4
Fall-related outcome	1	3
Caregiver outcome	1	
Successful treatment	1	
Other outcomes***		4

*Not clear how many sessions/contacts were included for Flood et al., 2005, Cameron et al., 1994, Coast et al 1998, Kjerstad et al., 2016. **When the analysis included more than one time-horizon, the most extended follow-up is presented. ***Including e.g., quality of life physical function, life years saved, goal attainment.

Type of interventions

The interventions were categorized into the following fields: Rehabilitation (*n*=22), fall prevention (*n*=6), health promotion (*n*=5), reablement (*n*=1), and health education (*n*=1). Given the different types of interventions, the actual content of the interventions varied substantially, see Appendix for details. Also, within the same type of intervention, there were differences regarding the content, number of sessions, duration and how the intervention was implemented. Regarding health promotion for example, Hay et al., implemented a program covering a broad range of topics carried out both in group and individual sessions over a period of 9 months[14], whereas Zingmark et al., implemented a one-session discussion group focused on a more narrow set of topics (e.g., physical activity, social participation, meaningful activity and healthy eating)[22]. Similarly, for fall prevention, one intervention included a one-hour home visit to assess fall hazards[26] whereas the most extensive intervention included a multifactorial and interdisciplinary team approach including a minimum of one, monthly, home visit for six months[21]. In all, interventions varied in terms of the number of sessions/contacts, between 1 e.g.,[27] to 95[28] and duration, between 1[26, 27] to 43 weeks[29]. For OT and MP interventions the mean number of sessions was 13,8 and 19,2 respectively; the average duration was 12,5 for OT interventions and 14,0 weeks MP interventions.

Comparators

In 12 OT studies and 17 MP studies the comparator was no intervention or standard care, Table 1. In the remaining studies, the comparator included some form of alternative approach/intervention e.g., an additional leaflet about avoiding falls[30], social visits[20] or an alternative intervention[14]. In the study by Hay et al., for example, a health promoting occupational therapy program was compared to a social activity group, defined as an active control group, and a no intervention control group, defined as a passive control group.

Time horizons

The time horizons for follow-up varied from 1 month[27] to 10 years[31] with a median/mean of 10/16 months. The two studies with the most extended follow-ups, ten and eight years, were model based[31, 32]. The average follow-up was 17,1 months for OT interventions and 14,6 for MP interventions, Table 1.

Health outcomes used

Cost effectiveness was established in relation to a range of health outcomes, the most common outcome being health related quality of life/QALYs (*n*=19), fall related outcomes, (*n*=6), and ADL (*n*=4), Table 1.

Study perspective and costs included

A societal perspective was the most common study perspective (*n*=23), Table 2. However, among the MP intervention studies, a service provider

perspective was also common, and was applied in seven out of the 17 studies. The costs included were related to the study perspective and varied, from studies including only intervention cost, e.g.,[23, 33] to studies including costs for the intervention, health and social care as well as private costs and/or informal care e.g.,[15, 19], Table 1.

Cost effectiveness

None of the studies included presented results in which the intervention had poorer effects compared to the control group, Tables 2 and 3. In eight OT studies as well as in seven MP studies the intervention had larger effects than the control group, whereas the remaining studies (eight OT and twelve MP) showed no additional effect compared with the control group. The costs were lower compared to the control group in three OT studies and in four MP studies. In thirteen studies (nine OT, four MP), the cost was higher in the intervention group compared to the control group.

Table 2

Distribution of studies including multi-professional interventions in relation to incremental effectiveness and incremental costs (n=19)

	Larger effects	No difference in effects
Higher costs	Clare et al., (2019), Goldstein et al., (1997), Jutkowitz et al., (2012)	Hendriks et al., (2008)
No difference in costs	Eklund et al., (2005), Kjerstad et al., (2016), Lamb et al., (2015)	Clarke et al., (2016), Irvine al., (2010), van Eeden et al., (2015), Markle-Reid et al., (2010), Nagayama et al., (2017), Parker et al., (2009), Sahota et al., (2017), Woods et al., (2012)
Lower costs	Zingmark et al., (2017)	Cameron et al., (1994), Coast et al., (1998), Miller et al., (2005)

In total, seven studies demonstrated that the new interventions (three OT, four MP) were cost effective based on greater effects in combination with similar or lower costs. In eight studies (five OT, three MP), the cost-effectiveness of the intervention needed to be interpreted in relation to the threshold chosen, i.e., how much more additional health effects are valued economically. In three of these studies, cost effectiveness was established in relation to QALYs[23, 27, 34] the cost per QALY gained varying from €468[34] to €47258[23]. Thus, all were within established thresholds for the intervention to be considered cost effective in the context in which the studies were made. In three studies, no established thresholds for outcomes on cost effectiveness were established, e.g., the additional cost for reducing one additional hour per day in caregiver burden[33]. In five studies (four OT, one MP), the intervention was not cost effective since it led to higher costs for no additional effect. In eleven studies, no differences in effects or costs were identified.

Table 3

Distribution of OT studies (n=16) in relation to incremental effectiveness and incremental costs between intervention groups and control groups

	Larger effects	No difference in effects
Higher costs	Campbell et al., (2005), Clark et al., (2012), Gitlin et al., (2010), Oppong et al., (2015), Sampson et al., (2014)	Flood et al., (2005), Mountain et al., (2017), Salkeld et al., (2000), Wales et al., (2018)
No difference in costs	Hay et al., (2002)	Nagayama et al., (2016), Sackley et al., (2016), Sturkenboom et al., (2015)
Lower costs	Graff et al., (2008), Smith et al., (1998)	Zingmark et al., (2015)

3.4 Discussion

Based on a broader search strategy than previously conducted systematic reviews, our results provide a comprehensive summary on the current state-of play on health economic evaluation for occupational therapy. However, methodological issues are critical when appraising the results of economic evaluations in occupational therapy[11]. In the following sections, we discuss the eight items selected from the CHEERS statement applied in this study[17] from the perspective of what we currently know and how knowledge gaps need to be adressed in future research.

Target group

There was substantial variation in how target groups were defined e.g., in relation to age, diagnosis, level of functioning and the type of intervention evaluated. Thus, the possibility of making comparisons betwen trials is limited. The key aspect of this item in the CHEERS statement is that target groups must be clearly defined and reasons provided as to why a target group was chosen. One example from our results is the study by Zingmark et al., who implemented health promoting occupational therapy for community-dwelling elderly persons aged 77-82 years[22]. The narrow age span was motivated by the years around 80 being critical in terms of an increased risk for functional decline, thus providing an incentive for the implementation of health promoting interventions. In contrast, other studies evaluating health promoting occupational therapy have applied less specific criteria related to age, e.g., above the age of 60 years[14] or 65 years[35] to identify the target group. Overall, the target groups were well defined, especially in studies that focused on a specific type of intervention implemented for a certain group e.g., fall prevention targeting older persons who had been to an emergency department after a fall[36].

Intervention content and design

The way interventions were implemented and the content they included varied substantially. Each intervention can be examined from the perspective of intervention components included and how the content and mode of implementation are expected to result in the effects intended. For further reading on the interplay between theory, choice of intervention, components included and outcomes that intervention are intended to have, we refer readers to the Medical Research Councils´ framework for complex interventions[37].

In this paper we focus on the perspective of the resources needed to implement intervention. One feature of a health economic evaluation is costing, i.e., to identify, measure and determine items to include when deciding which costs should be considered[38]. In many interventions, the cost of time for the personnel who carry out the interventions is the largest part of the intervention cost[22]. Thus, the number of sessions and duration of an intervention has an immediate impact on the cost for the

intervention. As shown in the results, interventions varied from one-session interventions to those incuding a large number of sessions over a period of up to 9 months. While each intervention can be discussed separately in relation to content and effects, an overarching question is how extended an intervention needs to be in order to give sufficient effects.

Taking preventive occupational therapy as an example, the studies by Hay et al.,[14] and Zingmark et al.,[22] provide two examples of interventions found to be cost effective. Thus, both could be considered for implementation as they seem to result in good value for money. However, while the overall focus of both interventions shared the same characteristics (to support an active lifestyle and thereby optimize health), the design of the interventions varied substantially. The intervention evaluated by Hay et al., included a 9-month program with weekly group sessions as well as up to 9 individual client contacts, whereas the intervention found to be most cost effective by Zingmark et al., included a one session discussion group. Even though the study by Hay et al., was well grounded in theory[39] and resulted in positive effects, such an extensive intervention may not be a good choice to implement given the resources required. This is especially the case since more recently short term interventions, have been found to be both effective and cost effective [40].

In general, the interventions included in this review can be categorized as fallprevention, health promotion/prevention of disability or ill health or rehabilitation/reablement. While there is still a need for more economic evaluations on these type of interventions, there is also a need to identify other areas of occupational therapy for older people in which economic evaluation could provide valuable input. Economic evaluations could, for example, be used when exploring the benefit of residential reasoning, i.e., interventions focused on optimizing possibilities for elderly persons in the process of ageing to continue living in one place, i.e., ageing att home in an ordinary dwelling[41].

Comparator

In general, the interventions covered were mainly evaluated in comparison to a "no intervention" control group, referred to as "comparator". Such study designs are relevant when considering if occupational therapy can provide better value for money than alternatives already existing. However, in some cases, there is already evidence available that a type of intervention is effective. In such cases, the new intervention should be compared to the established type of intervention. As an example, the "well elderly" trial conducted by Clark and colleagues in 1997 has been cited as providing evidence on the effectiveness of preventive occupational therapy[14, 42], and the results have inspired others to evaluate similar interventions[43]. The original intervention design, however, was very extensive, including multiple group and individual sessions over a period of nine months. To implement such an intervention for a broad target population would require

substantial resources both economically as well as personnel. Further, more recent trials indicate that preventive interventions with a shorter duration also lead to positive effects[40, 44]. So, in order to guide decision-making as to which type of intervention to implement different interventions can be compared to determine which type of intervention or mode of implementation leads to optimal effects and cost effectiveness. In this scoping review, a few such trials were identified[14, 22, 34].

The time horizon and study design

There was substantial variation in the length of time horizons applied for follow-ups. The study with the shortest follow-up[27] provides an example on how after only one month, different modes of implementing pre-discharge assessment can be evaluated and followed-up from a service provider perspective. While non-significant results indicated slightly better effects and higher costs for the intervention, the sample was small, and no firm recommendations could be drawn. Even if a small study, as the one by Sampson, is of limited use in providing recommendations for practise it can add vital knowledge in the process of designing more robust trials that can yield results towards informed decision making.

When specifically looking at QALYs, which capture the accumulated effects on self-assessed health, one central issue is the time horizon for the evaluation. For RCTs in which QALYs were used as the health outcome, the average time horizon was 7-9 months. Whether or not this is enough depends on to what extent all relevant effects and costs can be considered to have been captured. For example, in the study by Flood et al., the costs for home adaptations were included, but not the effects for self-assessed health and costs related to dependency beyond 8 months[19]. The limitation was discussed by the authors in terms to the effect that the analysis "may have produced a pessimistic view of cost-effectiveness".

Thus, a critical feature of future health economic studies in occupational therapy is the time horizon and, ideally, it should be longer than for earlier trials. However, due to practical reasons (e.g., attrition, costs, logistical issues), the implementation of longitudinal clinical trials is challenging, and it could be questioned whether or not a single trial can provide all the evidence needed to evaluate long-term cost-effectiveness. An alternative approach is to apply model-based designs e.g., decision modelling based on Markov models[45]. In decision modelling, information on study parameters from different sources is combined to study transitions between health states with, and without, an intervention and the resulting impact on health and costs. By applying model-based designs, the time horizon can be extended over a sufficiently long time period to capture all relevant health effects and costs. This method is used in the studies by Smith et al.,[31] and Zingmark et al.,[32]. At any given time, decisions need to be made on how resources can be used in an efficient way. Model-based designs provide one means of using already existing data to guide deci-

sion making instead of conducting a prospective trial that will, most likely, provide relevant knowledge in the future.

In previous reviews, model-based studies were excluded whereas in the present review, two model-based studies are included[31, 32]. One of these[32] applied an intervention effect from a randomized controlled trial [46], data on transitions between health states from a longitudinal cohort study[47] and data on societal costs from a Swedish study[48]. A possibility for future clinical trials is to determine intervention effect and cost effectiveness over the trial period and estimate long-term cost effectiveness over an extended period using relevant sources of information in a statistical extrapolation[45]. The use of model-based designs for economic evaluation seems to be underutilized within the field of occupational therapy in comparison with other fields[49].

One additional point regarding the most frequently used study design, the RCT, is that health economic evaluation is usually implemented as part of an original trial designed to evaluate effects on primary outcomes. Thus, a more correct way of describing such study designs would be as an economic evaluation conducted alongside an RCT. This difference extends beyond the actual terms in that effectiveness trials are usually powered to detect statistical differences in primary outcomes. Thus, potential differences on secondary outcomes such as health outcomes and costs for a health economic evaluation may not be detected[50]. In our results, 23 out of 35 studies, showed no significant differences on either health outcomes and/or costs. We cannot draw any conclusion as to whether these results can be explained by underpowered trials or that interventions in fact had no significant effect. Improving the possibility of identifying significant differences on health-economic outcomes, is however, an issue that needs to be considered at the planning stages of a trial (e.g. larger samples), rather than health economic evaluation being an add-on to effectiveness trials.

One recommendation for future research is to consider sufficient sample sizes also in relation to health economic outcomes and consider how a sufficient time horizon can be ensured; is it possible to extend the study period for additional years or can model-based methods be used to extrapolate future effects and costs?

Health outcomes used

A central issue in health economic evaluation is which outcomes, resource uses and costs that should be evaluated. The results of a health economic evaluation is presented in terms such as the cost per unit of outcome. One option is to use a primary outcome and ideally, that outcome must have a close link to the intervention under investigation[51] e.g., the cost per fall averted when evaluating a falls-prevention program[30]. Other examples of study-specific outcomes from our review are successful treatment (a combination of patient and caregiver outcomes)[15], caregiver vigilance

(e.g., hours doing thing, hours being on duty)[33], and perceived security in performing daily activities[52]. All these outcomes can be relevant given that they are closely linked to the intervention under study as well as for the purpose of identifying the most cost-efficient method to optimize such outcomes. In terms of comparing an intervention with a comparator, this type of economic evaluation could be used to identify the most cost-effective format when comparing different occupational therapy interventions.

However, for the purpose of decision making and prioritizing actions within budgetary limits e.g., within health and social care administration in a municipality, it is difficult to compare the cost-effectiveness of different interventions without having a common measure of effect. A social care intervention, for example, may affect other outcomes than that which an OT intervention affects. To address such concerns, the concept quality adjusted life years (QALYs) was developed, including a combined measure of self-assessed health and time[38]. As indicated by our results, the use of QALYs is the most frequently used outcome measure in OT interventions whereas for MP interventions, other outcomes were also used. When QALYs are used, the instruments frequently used to evaluate self-assessed health are EQ-5D or SF 12[53]. A limitation of both instruments can be that they are less sensitive detecting effects of an intervention than primary outcomes. In the case of EQ-5D, recent research indicates that the version which includes 5 levels for each domain (EQ-5D 5L) is more sensitive than the original version (EQ-5D 3L) and should, therefore, be used. Our finding is that the choice of health outcome needs to be considered in relation to the purpose of a study.

Study perspective and costs included

For both OT and MP interventions, most studies were conducted from a societal perspective. To apply a societal perspective is in line with some existing recommendations[54] and in conflict with other[55]. In Europe, there are variations between country-specific recommendations as to which study perspective to apply[54]. The argument for a societal perspective is that it reduces the risk that relevant costs are missed, which might be the case if evaluations are conducted from a narrower perspective such as a provider perspective. For example, if only the health-care costs related to fall-related injuries were included (from a health care provider perspective) the lack of information on the long-term costs for social support or special housing would, most likely, lead to an underestimate of the overall societal costs. In contrast to those arguing for a societal perspective, the British National Institute for Health and Care Excellence (NICE) recommends that costs should be considered from a provider perspective[55]. According to NICE, a provider perspective is more appropriate since the use of health economic evaluations to guide decision making is done in relation to a specific service provider´s budgetary limits. Thus, arguments for both perspectives exist.

As a minimum requirement the study perspective should be clearly stated and using that perspective, all relevant costs should be included[17]. In this scoping review, all but two studies stated the study perspective[12, 23].

However, independent of study perspective, the specific cost items that were included varied, Table 1. While the costs for the intervention, health care and/or social care were usually included, costs related to a person or informal caregiver were included less often. Thirteen studies included costs related to the intervention, health care, social care and private/informal care costs. As shown by Graff et al., 2008[15], the main cost saving was related to informal care (-€1762) indicating the importance of including such costs. If these costs had not been included, the results would have been different.

Another type of cost, included in only one study, is screening costs[30]. Screening was conducted to identify eligible clients deemed most likely to benefit from a falls prevention program resulting in 364 out of 6133 persons screened (6%) choose to participate. The cost for screening was substantial, equal to 47% of the intervention cost and 7% of the total costs from a service provider perspective. Thus, the costs included is a critical feature of health economic evaluations and should be thoroughly considered early in the planning stages of all trials so that data on all relevant costs are collected in relation to the context the study is to be conducted.

Furthermore, how to interpret the results of an economic evaluation needs to be considered in relation to the country-specific context since differences occur regarding legislation, organization and the roles and responsibilities of different stakeholders.

Cost effectiveness of included studies

In all, 19 interventions in the 35 studies identified in this scoping review can be considered more cost effective than compared to the control group. Of these, 11 studies resulted in larger effects than the comparator at a similar or lower cost, or similar effects at a lower cost. These interventions are, therefore, clearly more cost effective than the comparator. For the remaining 8 studies, the interpretation of whether or not the intervention can be considered cost effective needs to be discussed in relation to established budgetary limits. This question needs to be addressed from the perspective of there being a reasonable balance between the additional cost of the intervention in relation to the additional effect? In relation to the cost per QALY gained there are established thresholds indicating if an intervention can be considered cost effective[56]. For the 8 studies above, with larger effects and higher costs, 3 showed cost effectiveness in relation to QALYs[23, 27, 34]. For these interventions the cost per QALY gained was below established thresholds and can be considered cost effective.

For the remaining five studies, the outcomes included goal attainment, additional life years, falls prevented, outcomes related to caregiver burden

and disease-specific outcomes related to chronic obstructive pulmonary disease. While these outcomes may be relevant for the purpose of the study, interpreting the results is not straightforward. In the study by Gitlin, the intervention targeted persons with dementia and their caregivers. Cost effectiveness was established as, for example, an incremental cost of €2.72 for one hour fewer per day of doing things for the person with dementia[33]. Even though a reduced caregiver burden is a clearly relevant positive outcome, the lack of thresholds makes interpretations difficult. For each dyad (a person with dementia and caregiver) the annual cost reduction for lowering caregiver burden by one hour per day would be around €1000. Whether or not this effect is in reasonable balance to the cost remains to be explored and must be related to the context in which the intervention is going to be implemented. The same applies for studies in which outcomes with no established cost thresholds are used.

Four studies resulted in higher costs for the intervention but no additional effects. However, as stated earlier, the study by Flood et al.,[19] might have underestimated the effect of the intervention due to a too short follow-up. In summary, while somewhat more than half of all the studies investigated were cost effective, the results must be interpreted in relation to the strengths and limitations of each study.

3.5 Limitations

This scoping review has limitations. The stages of identification and screening (figure 1) were performed by one person. However, the search strategy was developed by the project group (authors) in collaboration with an experienced university librarian. Furthermore, the process of deciding which studies to include or exclude was discussed by the authors on several occasions. Throughout the process, an inclusive approach was adopted and at the stage of charting data, a final decision on which studies to include was made in consensus.

Examining differences between OT and MP studies was beyond the purpose of this study. While some differences seem to exist, e.g., health outcomes used, number of sessions/contacts, we choose not to explore these potential differences further.

Only complete economic evaluations were included. Thus, studies only focusing on which impact OT interventions had on costs were excluded. In terms of health economic evaluation, this choice can be argued to be correct, although it should be added that considering cost analyses can be relevant since economic issues are high on the agenda in most organizations. However, it is important for clinicians as well as researchers to understand the basic theory underpinning economic evaluation[38]. Resources, including economic resources, are limited. Given such constraints it is highly relevant to consider the outcomes produced i.e., the health effects gained from different courses of action and not only costs.

Even given our more inclusive approach regarding how to identify health economic evaluations related to occupational therapy, only a total of 35 studies from different fields of practice could be identified. Thus, the conclusions made by Lambert and colleagues in 2014 still hold; there are too few published health economic evaluations within occupational therapy, thereby limiting decision making on how to use resources efficiently[10].

3.6 Conclusions

In general, most of the studies adopted a societal perspective, compared interventions in relation to no intervention or usual care, and used QALYs as the measure of health effect. Of the studies based on RCTs, about half had a follow-up of less than a year. Regarding cost effectiveness, 19 out of 35 studies can be considered cost effective. Occupational therapy interventions have the potential to positively affect health outcomes such as performance of daily activities, involvement in valued life situations and supporting older people to remain independent. Thus, such interventions are also likely to have economic implications since disability and dependency have a major impact on societal costs[48]. It is, therefore, important that the profession continues to use economic evaluation.

We conclude that for, future economic evaluation in occupational therapy, researchers need to pay considerable attention to studydesign, collect all relevant data on both costs and effects, follow costs and effects over a sufficient time period and ensure that studies are statistically powered to detect differences in both costs and effects. Beside conducting economic evaluations as part of longitudinal clinical trials, model-based study designs can provide a valuable tool for using already existing data and extrapolating intervention effects over a longer time horizon. For practitioners, this scoping review, together with future publications can provide guidance on which interventions to implement. In terms of developing and refining occupational therapy interventions the question of which outcome(s) can best capture the benefits of occupational therapy needs to be discussed among practitioners and researchers and subsequently, how interventions should be designed to optimize outcomes in an efficient way.

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4. Author presentation

The project group
This report is a collaboration between the members of the project group and all of them are co-authors to all chapters. Every chapter has a main author that were responsible for the writing process and the final text.

Ulrika Bejerholm
Reg OT, is professor in mental health and mental health services research at Lund university, Sweden. Her main research interests are psychosocial interventions that enable personal recovery and well-being for services users. UB leads Mental health, acitivity and participation, and Centre for evidence based psychosocial interventions (www.cepi.lu.se).

Susanne Johanson
Reg OT, PhD and assistant researcher at Department of Health Sciences, Lund university, Sweden. Her main research areas are mental health, return-to-work and implementation of complex interventions. She has a clinical background in primary healthcare and rehabilitation medicine. SJ is the main author to Chapter 2.

Maurits van Tulder
Professor Health Technology Assessment and Dean of faculty Behavioural & Movement Sciences,Vrije Universiteit Amsterdam, the Netherlands and affiliated professor at Department Physiotherapy and Occupational Therapy, Aarhus University Hospital, Aarhus, Denmark. His main research areas are effectiveness and cost-effectiveness of interventions for musculoskeletal disorders.

Magnus Zingmark
Reg OT, PhD and head of research and development on active and healthy ageing in Östersund municipality, Sweden and affiliated researcher at Epidemiology and global health, Umeå University. He focuses on prevention, health promotion and reablement with an emphasis on health economics and implementation. MZ is the main author of Chapter 3.

Lisa Gregersen Østergaard
OT, PhD, senior researcher at DEFACTUM, Central Denmark Region. She is affiliated to Department of Physiotherapy & Occupational Therapy, Aarhus University Hospital, and Institute of Public Health, Aarhus University. Her main research area is to develop and evaluate complex interventions in occupational therapy and rehabilitation. One focus is to perform both clinical and economic evaluations alongside clinical trials. LGO is the main author of Chapter 1.

Besides the project-group the following researchers contributed as co-authors.

In chapter 1: **Johanna M van Dongen**, PhD, Assistant professor, department Health Sciences,Vrije Universiteit Amsterdam, the Netherlands.

In chapter 3: **Tina Helle,** Reg OT, PhD, associated professor, the division of occupational therapy, University college of Northern Denmark, Aalborg.

Annelie Schedin Leiulfsrud, reviewed different version of the report. ASL is Reg OT, is associate professor at Department of neuromedicine and movement science at Norwegian university of science and technology, Faculty of medicine and health science, Norway.

Carita Nygren, registered OT, PhD and strategic development manager at the Swedish Assoiation of Occupational Therapists, was project leader and editor of the report.

Appendix

Included studies presented as interventions including occupational therapy only and multi-professional interventions including occupational therapy as a significant component.

Type of intervention Occupational therapy (*n*=16)	Study	Target population	Intervention	Cost effectiveness
Fall prevention	Campbell et al., 2005, New Zealand.	Older people 75 years or older with low vision living in the community, *n*=391.	The two intervention groups included: A home safety assessment and modification programme implemented by an occupational therapist (three contacts over six months. An Otago exercise programme and D-vitamin supplement implemented by a physiotherapist (five visits over six months).	At 12 months, the home safety programme reduced **falls** with 41% in relation to all groups not receiving the intervention and with 61 % in relation to social visits. The home intervention programme reduced **injurious falls** with 44% in relation to social visits. The exercise program alone or in combination with the home safety programme was not effective on reducing **falls** or **injurious falls**. Included costs were: intervention costs, health care, municipality, private, charity organizations, recruitment cost. The intervention cost for the home safety programme was or €256 (SD €230) per person. The incremental cost per prevented fall was €512. (range in sensitivity analysis €362-€1236).
Health promotion	Clark et al., 2012, USA.	Residents, users or visitors to senior centers and residences 65-90 years old, *n*=460.	The 6-month intervention included weekly group sessions and up to 10 individual sessions focusing on identifying and managing activity related challenges. Examples on topics included: impact of everyday activity on health, transportation, time use, safety at home and in the community, social relationships, goal setting.	At 6 months, compared to no intervention, the intervention had a significant effect (p<0.02) on **QALYs** at 6 months (0.038 QALYs) compared with no treatment. Included costs were: Intervention costs based on salary for an OT + 32% fringe benefits. The intervention cost was €898 per participant on average. The cost per QALY was €47258compared with no treatment.
Rehabilitaion/ reablement	Flood et al., 2005, UK.	Persons 65 years and older, *n*=321.	Occupational therapy assessment, in the person´s home. Focus on supporting independence and staying in place.	At 8 months, compared to standard care (assessment by social worker), there was no significant difference (p=0.29) between groups in **EQ-5D scores** 0.45 (intervention) vs 0.49 (control). QALYs was not reported. Included costs were: Intervention, health care, municipality, patient and caregiver costs. The OT intervention mean cost was €345 (SD 412) per participant. The SW intervention mean cost was €156(SD 376) per participant. The societal cost for the OT intervention was €8304(SD 7914) compared to €7277(SD 8981) in the SW control group. The difference was €1030 (95% CI -823 to 2881). Cost-effectiveness acceptability curves showed that, independent of cost-effectiveness threshold, the probability of occupational therapy being more cost effective was below 50%.
Rehabilitation	Gitlin et al., 2010, USA.	60 dyads dementia patients at a moderate stage and their caregiver). Mean age was 79 years (56-96).	A four-month program including a maximum of eight sessions (home visits and brief telephone calls) delivered by occupational therapists. The intervention included education on caregiving, interview focused on identifying activities matching the patient capabilities and interests that could be "prescribed", problem-solving techniques with caregiver on how to support engagement in activities.	At 4 months, compared to no intervention, the intervention had positive effects on both outcomes resulting in a net reduction of 3.3 h on "**hours doing things**" (p=0.005) and a net reduction of 6.9 h on "**hours being on duty**" (*p*=0.001). Included costs were: intervention, caregiver time in sessions, travel. The average cost for the intervention was €1080. ICER was calculated as the additional costs for bringing about one additional hour per day per caregiver for each of the two outcomes: ICER in relation to one hour of "doing things" was €2.72; ICER in relation to one hour "being on duty" was €1.26.
Rehabilitation	Graff et al., 2008, Netherlands.	Community-dwelling persons 65 years and older with mild to moderate dementia, *n*=135, and their caregiver.	Ten one-hour sessions over 5 five weeks. Including both the patient and caregiver, the intervention was focused on defining problems and prioritizing activities, using compensatory and environmental strategies to optimize engagement in activities. Caregivers were trained on how to use effective supervision, problem solving and coping strategies as to maintain autonomy and social participation.	At 3 months, compared to usual care, the intervention group 37% of the participants had **a successful treatment** compared to 1.5% in the control group. Included costs were: Intervention costs, health care, hospitalizations, social care, informal care. The average cost for the intervention was €1507. The difference in total care costs was €2226 lower for the intervention group (€16000) compared to the control (€18227). At a willingness to pay €2547 per successful treatment, there was a 99% probability of occupational therapy being cost effective.

Type of intervention Occupational therapy (*n*=16)	Study	Target population	Intervention	Cost effectiveness
Health promotion	Hay et al., 2002, USA.	Persons 60 years and older, *n*=361.	A 9-month program including weekly two-hour sessions and nine hours of individual OT. The focus was on supporting participants to make healthy lifestyle changes. The intervention included topics such as activity analysis, home and community safety, transportation, adaptive equipment, exercise, nutrition.	At 15 months, compared to an active and passive control group, the intervention resulted in significantly smaller decline in health-related quality of life resulting in 0.045 **QALYs** gained (p<0.001). Included costs were: Intervention costs, health care, hospitalizations, informal care. The average cost for the intervention was €941. The total average cost during the treatment phase and up was non-significantly different. The ICER for OT versus both control groups was €18324/QALY gained (95% CI 11580-43646).
Prevention/ health promotion	Mountain et al.. 2017, UK.	Persons 65 years and older *n*=288.	Occupation-focused and occupation-based weekly group sessions led by facilitators over 4 months based on the Lifestyle Matters program (focus on improving well-being, avoid decline due to social isolation and poor mental health). Sessions focused on topics selected by participants aiming to promote engagement and independence in new or neglected activities with an emphasis on activities in the community.	At 6 and 24 months, compared to usual care, the intervention did not result in any significant health effects at any follow-up. Included costs were: Intervention, healthcare, social care. The cost of the intervention was estimated to be in the range €565-756. ICER was €10019 (SF-6) and €10329(EQ-5D). At a willingness to pay threshold of €26278 there was a 30% probability of the intervention being cost effective.
Rehabilitation	Nagayama et al., 2016 Japan.	Persons living at geriatric health service facilities *n*=44, mean age 82 years.	An iPad application (Aid for Decision-making in Occupation Choice) including illustrations describing daily activities was used to promote shared decision-making and setting occupation-based goals. The intervention was implemented twice per week over 4 months.	At 4 months, compared to usual care, the intervention had no significant effect on **QALYs** (-0.02; 95%CI -0.05 to 0.01). Included costs were: Intervention, health and social care. Total costs were similar (€11364 in the intervention group and €111124 in the control group). There were no differences on any of the outcomes, except the Barthel index; a higher proportion of participants in the intervention group improved in ADL (47.8%) compared to controls (4.8%). ICER in relation to ADL was €61.6 per change in BI score.
Rehabilitation	Oppong et al., 2015, UK.	Older Adults, 50 years or older (average 66 years), with hand osteoarthritis (OA), *n*=257.	Three interventions including 4 weekly group sessions; joint protection, hand exercises, joint protection plus hand exercises. All interventions included core components such as education on management of OA; pain management during daily activities, changing habits, goal settings whereas each intervention arm more specifically focused on joint protections and hand exercises respectively.	At 12 months, compared to standardized information delivered by a leaflet, all interventions resulted in higher **QALY** scores compared to the control, hand exercises had the largest effect. Included costs were: Intervention, health care. The intervention costs for joint protection plus hand-exercises was € 94, for hand exercises € 54and for leaflet and advice € 42. Based on different analytic approaches, ICER ranged from €468-2214 per QALY gained. The intervention had between 70-80% chance of being cost-effective at a threshold of €29402/QALY gained.
Rehabilitation	Salkeld et al., 2000 Australia.	Persons 65 years and older, *n*=530.	One-hour home visit using a standardized home assessment form to identify fall hazards. The occupational therapist supervised that recommended home modifications were completed.	At 12 months, compared to usual care, the intervention resulted in non-significantly fewer **falls** in the intervention group compared to controls. There was no difference in self-rated health. Included costs were: intervention, health care, formal and informal care. The intervention cost was €122.The average total cost was €8674 (control) and €10566 (intervention). The mean cost per fall averted was €5205.
Rehabilitation	Sampson et al., 2014, UK.	Patients with a stroke, *n*=65.	Pre-discharge home assessment visit conducted by an occupational therapist.	At 1 month, compared to a pre-discharge home assessment conducted in hospital by an occupational therapist, the intervention resulted in an incremental **QALY** gain of 0.005 (95% CI -0.009–0.020) compared to the control. Included costs were: intervention, hospital interview The cost of the intervention was €262 giving an incremental cost of €161 (95% CI €121–€201). Thus, ICER was €30724 and at a threshold of €27948 per QALY gained, the intervention had a 47% chance of being cost effective.

Type of intervention	Study	Target population	Intervention	Cost effectiveness
Occupational therapy (*n*=16)				
Falls prevention	Smith et al., 1998, Australia.	Independent-living persons 75 years or older.	Assessment, by occupational therapist, of fall hazards at home including recommendations to minimize risks for falls. Provision of devices to prevent falls e.g., non-slip bathroom mat, grab bar, raised toilet seat.	Based on previously published data, the intervention was hypothesized to **reduce falls** with 25% over a year compared to no intervention. Included costs were: intervention, health care, social care. The average costs for the intervention was estimated to €259. In one year, the incremental cost per fall averted was €1826 and per injury averted €18303. Over 10 years, the intervention was cost saving.
Rehabilitation	Sturkenboom et al., 2015, Netherlands.	Community-dwelling persons with Parkinson´s disease, *n*=191 and 180 primary caregivers.	Patients and their caregivers received 10 weeks of individually tailored occupational therapy based on national guidelines. The intervention focused on improving performance of activities prioritized by the patient. Caregivers needs were assessed and addressed if required.	At 6 months, compared to usual care, the intervention had a positive effect on **QALYs**. Included costs were: intervention, health care, social care informal care, lost productivity due to absence from work. The average cost for the intervention was €792. In all analyses, there were no significant differences in costs between the groups. At a threshold of €20844 per QALY gained, the benefit of the i ntervention for the caregiver had a 95% chance of being cost effective.
Rehabilitation	Wales et al., 2018, Australia.	Persons 70 years or older discharged from medical or acute wards, *n*=400.	Discharge program incl. pre- and post-discharge home visits, a broader approach than usual care related to optimizing the person´s functional abilities and home environment, two and four weeks to promote further goal attainment and problem solving related to functioning.	At 3 months, compared to usual care, the intervention had no effect on **ADL** or **QALYs**. Included costs were: intervention cost, health care cost, social care costs. The intervention cost was €139 higher for the intervention compared to usual care. At 3 months, the mean total cost, was higher €5715 (95%CI 4180-7251) for the intervention group compared to €3336(95% CI 2407-4265) in the control group.
Health promotion	Zingmark et al., 2016.	Older people 77-82 years old, *n*=177.	Occupation-focused addressing aspects of healthy aging (e.g., physical, social, eating-related, and meaningful activities). Three formats; a person-centered a person-centered individual intervention including home visits; an activity group including 8 sessions and engagement in activities; a discussion group including one session.	At 3 months and 12months the interventions were compared to no intervention. Included costs were: intervention costs, municipality cost, health care costs. **Individual intervention:** no significant effect on **QALYs** or costs at any follow-up. The intervention cost was €187 per participant on average. **Activity group:** significant effect on **QALYs** at 3 months (0.006 QALYs), no effect on costs at any follow-up. The intervention was cost effective at 3 months. The intervention cost was €178 per participant on average. **Discussion group:** significant effect on **QALYs** at 3 months (0.007 QALYs), significant effect on costs at 3 months (€1241 lower than control) and 12 months (€4514 lower than control). The intervention was cost effective at 3 and 12 months in relation to the control group and the other interventions. The intervention cost was €34 per participant on average.
Multi-professional intervention, occupational therapy significant component (n=19)				
Rehabilitation	Cameron et al., 1994, Australia.	Persons who had sustained proximal femoral fractures *n*=252.	Accelerated rehabilitation including an individual plan including multi-professional efforts to support mobility and self-care immediately after surgical treatment to be continued over the entire period before and after discharge.	At 4 months, compared to usual rehabilitation, the intervention had no additional effect on **recovery in ADL**. Included costs were: intervention, health care, social care, informal care. The total costs were lower in the intervention group. The cost per recovered patient was €27011 for accelerated rehabilitation compared to €39655 for usual rehabilitation.
	Clare et al., 2019, UK.	Older people with a diagnosis of dementia, *n*=475.	Cognitive rehabilitation (CR) in the persons´ home incl. ten therapy sessions over 3 months, followed by four maintenance sessions over 6 months, delivered in participants' homes.	At 9 months, compared to usual care, the intervention had a positive effect on **goal attainment** but no effect on **self-efficacy** or **QALYs** (for the person or the carer). Included costs were: intervention cost, health and social care costs, private costs. The intervention cost was €2299. At 9 months, the mean total cost for each group was €31004 (CR) and €29896 (usual care). Costs were not significantly different between groups. In relation to goal attainment, the intervention had over 99% probability of being cost effective at a threshold of €3209 or higher.

Type of intervention	Study	Target population	Intervention	Cost effectiveness
Multi-professional intervention, occupational therapy significant component (n=19)				
Rehabilitation	Clarke et al., 2016, UK.	Patients with Parkinson´s disease 35-91 years old (88% older than 60), *n*=762.	Patient-centered occupational and physiotherapy with individual assessment and goal setting. On average, 4 sessions over 8 weeks. Occupational therapy was mainly implemented in the community and focused on transfers, dressing and grooming, sleep and fatigue, indoor mobility, household tasks, and and environmental issues. Physio-therapy was mainly implemented in outpatient settings and focused on gait, posture, balance, physical conditioning and transfers.	At 15 months, compared to no intervention, the intervention resulted in an incremental **QALY** gain of 0.027 (95% CI −0.010 to 0.065). Included costs were: intervention, primary care, medication, health care, social care. The intervention cost was €184 per participant on average. The incremental total costs for the intervention per patient was €222 (95% CI €191 to €634). The incremental cost per QALY gained (ICER) was €4729 (95% CI −€229309to €238770). The probability that PT/OT was more cost-effective than no intervention at willingness-to-pay thresholds of €6769-54156 per QALY gained was approximately 50%.
Rehabilitation	Coast et al., 1998, UK.	Hospitalized, medically stable older patients 60 years or older, *n*=241.	Hospital care with early discharge and home-based rehabilitative care implemented by nurse, physiotherapists, occupational therapist and support workers.	The intervention was compared to care as usual at 3 months. Given that equal effects had been established (e.g., mortality, functional ability, quality of life) a cost-minimization analysis was conducted. Included costs were: health care social care, private costs. The mean cost for the intervention was €5415 compared to €7085in the control group.
Health education	Eklund et al., 2005, Sweden.	Community-dwelling people 65 years or older, aged-related macular degeneration, *n*=229.	A health education programme led by an occupational therapist. Included weekly sessions for eight weeks. Other professionals e.g., opthalmologist, optometrist, low vision therapist and lighting expert was invited to give information.	At 28 months, compared to usual care, the intervention had a positive effect in that a larger proportion had improved their **level of security in performing daily activities** 45% vs 10% in the control group (CI 95% 21 – 49, p<0.001). Included costs were: intervention cost, health care, social care, informal care, assistive devices, housing adaptation, special housing. The intervention cost was €156 per participant on average. The societal costs were lower for the intervention (€3385) than for the control (€4392). The difference was not significant (p=0.425). The societal costs per case of improved level of security in performing daily activities was €7495 (intervention) vs €43296 (control).
Rehabilitation	Goldstein et al., 1997, USA.	Eighty-nine persons with chronic obstructive pulmonary disease (COPD), mean age 68 years SD+/- 8 years.	Two phases: (1) two-month inpatient phase including breathing classes, treadmill walking, leisure walking, upper extremity exercises, interval training, (2) four-month outpatient phase in the clients´ home including daily exercise program and a discharge program including physiotherapy and occupational therapy.	At 6 months, compared to usual care, the intervention had an effect that exceeded a minimal clinically important difference on **mastery** and **dyspnea**; mean difference 0.70 and 0.61 respectively. Included costs were: health care, medications, homecare, assistive devices, transportation. The incremental cost for the intervention was Canadian €14762 of which €13020 incurred during the in-patient phase. Cost effectiveness was established in relation to cost per unit of change for mastery and dyspnea resulting in the following cost effectiveness ratios: €21089 (mastery) and €24200 (dyspnea).
Fall prevention	Hendriks et al., 2008, Nether-lands.	Community dwelling persons 65 years and older who had vistied the emer-gency department after a fall, *n*=333.	Interdisciplinary intervention program for 3,5 months including medical and OT assessment (e.g., medication use vision, balance, mobility, hearing, daily functioning, environmental hazards). Actions to address fall risks included recommendations to the client and to the clients' GP (e.g., home safety, behavioural change, referral to other relevant services).	At 12 months, compared to usual care, the intervention had no effect on number of **persons falling** or **QALYs** (p≥0.59). Included costs were: intervention costs, health and social care costs, private costs. The intervention cost was €490 per participant on average. The total average cost during the treatment phase and follow-up was did not differ significantly between groups (*p*=0.86). The intervention was not cost effective. Bootstrapping indicated a 27% probability of the intervention resulting in better health outcomes and lower costs.

Type of intervention	Study	Target population	Intervention	Cost effectiveness
Multi-professional intervention, occupational therapy significant component (n=19)				
Fall prevention	Irvine et al., 2010, UK.	Community-dwelling persons 70 years and older identified as having high risk of falling by their GP after screening, *n*=364.	A multifactorial fall prevention program tailored to individual needs including medical assessment, strength and balance training, home hazards assessment, referral to other specialists if found necessary. A falls prevention information leaflet "Avoiding Slips, Trips and Broken Hips".	At 12 months, compared to a control group receiving the same leaflet as in the intervention group, participants in the intervention group had fewer **falls** (2.07) compared to controls (2.24), the difference was not significant. Included costs were: screening costs, intervention costs, health care costs. The screening cost was €262 per participant on average. The intervention cost was €555 per participant on average. The total costs were non-significantly higher in the intervention group. ICER per fall averted was €5281. Based on cost-effectiveness acceptability curves, the probability of the intervention being cost effective was less than 40% independent of cost.
Health promotion	Jutkowitz et al., 2012, USA.	Community-dwelling persons 70 years or older experiencing functional difficulties, n=319.	Five occupational therapy contacts (four home visits, one telephone contact) focusing on strategies to address prioritized activity limitations. One physical therapy home visit focusing on exercises (balance, strength), fall recovery, referral to other services if required. The intervention was implemented over six months.	At 2 years, compared to usual care, the intervention resulted in significantly lower **mortality rates** 6% vs 13% (p=0.02). Included costs were: intervention; average cost for the intervention €1179. In relation to one additional life-year, the ICER was €16500. At a threshold of €16276 per additional life year, the intervention had a 50% chance of being cost effective.
Rehabilitation	Kjerstad et al., 2016, Norway.	Community dwelling persons applying for or being referred for home-based care *n*=46, mean age 79 years.	A baseline assessment conducted by an OT and physiotherapist (e.g., COPM) guided the identification of prioritized activities and goals. The intervention included supervision of home-based care personnel on training in daily activities, advice on assistive devices and physical exercises. The intervention was tailored to individual needs over a maximum period of 3 months.	At 9 months, compared to usual care, the intervention participants had higher average scores on both **COPM-P** (occupational performance) and **COPM-S** (satisfaction with occupational performance) (1.32 and 1.72 respectively, p≤0.043). Included costs were: intervention, social care. The average total costs in the the intervention group was €709 compared to €836 in the control group during the the 3-month intervention period. Over the 6 months follow-up period the average costs were €726 (intervention) compared to €1563 (control). Based on a willingness to pay €224 for an extra point of improvement, there was an 88% probability of the intervention being cost effective for COPM-P and 91% for COPM-S.

Type of intervention	Study	Target population	Intervention	Cost effectiveness
Multi-professional intervention, occupational therapy significant component (n=19)				
Rehabilitation	Lamb et al., 2015, UK.	Adults with rheumatoid arthritis who had pain and dysfunction of the hands *n*=490, mean age 62 years.	Intervention including six meetings with an occupational therapist or physio-physiotherapist including mobility, strength and endurance exercises. The aim was to increase repetitions and resistance over time. The intervention included goal setting, exercise contract, diaries and review of goal settings aiming for the client to do daily exercises over a minimum of 12 weeks.	At 12 months, compared to usual care, the intervention resulted in **QALY** gains equal to 0.01 (EQ-5D) and 0.02 (SF-6). Included costs were: intervention, health care. The average intervention cost was € 219. Health care costs were non-significantly higher €145 (95%CI -869 to 1171). ICER per QALY gained was €13316 (based on EQ-5D) and €10397 (based on SF-6).
Falls prevention	Markle-Reid et al., 2010, Canada.	Persons 75 years or older, newly referred for home care services, *n*=109.	In addition to usual care, participants in the intervention group received a multifactorial approach with a minimum of monthly visits during six months by a multi-professional team focusing on assessments to identify risk factors for falls and other factors influencing health, regular management and assessment of modifiable risk factors, intensive support to the participant including education on falls prevention.	At 6 months, compared to usual care, the intervention had no effect on number of **falls** in the total sample: difference in mean number of falls at six months (1.45 vs. 1.33, p = 0.70) or change in mean number of falls (−0.31 vs. −0.35, difference: 0.04,95 % CI: −1.18 to 1.27). Included costs were: intervention, health care, social care. There were no significant differences in costs between the two groups. The intervention was not cost effective.
Rehabilitation	Miller et al., 2005, UK.	Persons 65+ being discharged with on-going re-habilitation and social needs, *n*=370.	Early discharge and rehabilitation service including a home care and rehabilitation package providing up to four visits per day for up to 4 weeks, delivered by a multi-professional team.	At 12 months, compared to usual care, the intervention had no additional effect on **QALYs** gained. Included costs were: intervention, health care, social care. The total costs were € 3333 lower in the intervention group; £8361 in the intervention vs € 19469 in the control group. At a willingness-to pay threshold of € 9649 per QALY gained the intervention had a 98% chance of being cost effective.
Rehabilitation	Nagayama et al., 2017, Japan.	Stroke patients, 40 years or older, *n*=48, mean age 67 years.	Occupation-focused decision-making using the application (Aid for Decision-making in Occupation Choice, see Nagayama above). Intervention was mainly occupation-based focused on the clients´ prioritized activities. Rehabilitation sessions were implemented for more than 5 times per week for over 40 min per session.	At 6 months, compared to usual care, the intervention had no significant effect on **QALYs** gained in relation to the control group in the unadjusted analysis (-.002; 95%CI -.035 to .032) whereas when adjusted for baseline utility scores and days at hospital, the difference was significant (.005; 95%CI .002 to .008). Included costs were: intervention, health care. The total medical costs were € 36090 in the intervention group and € 38538 in the usual care group; the difference was not statistically significant. Given a willingness-to pay threshold of € 43900, the inter-vention had a 63% chance of being more cost effective.
Rehabilitation	Parker et al., 2009, UK.	Clients referred for multidisciplinary rehabilitation 80% older than 65 years, *n*=89.	Home-based rehabilitation including occupational therapy and physiotherapy, e.g., stroke rehabilitation, falls assessment.	At 6 and 12 months, compared to day hospital rehabilitation, the intervention had no effect on **ADL** or **QALYs** and a cost-minimization analysis was chosen. Included costs were: intervention, health care, social care, informal care. No significant differences between groups were identified on total costs: € 17736 in the home-based rehab group vs. € 18872 in the day hospital group.

Type of intervention	Study	Target population	Intervention	Cost effectiveness
Multi-professional intervention, occupational therapy significant component (n=19)				
Rehabilitation	Sahota et al., 2017, UK.	Persons 70 years or older admitted to elderly care medical wards, *n*=250.	Community-based team providing rehabilitation seven days a week both in the ward at in the clients´ home before and after discharge. Close collaboration with community-based health and social care and informal caregivers.	At 3 months, compared to hospital-based rehabilitation provided during weekdays, the intervention resulted in 0.04 **QALYs** gained (non-significant). Included costs were: intervention, health care. Mean costs were € 4919 in the intervention group and € 4734 in the control group. There was no difference in total costs (mean cost difference €190; 95% CI −2162 to 2541). Based on bootstrapping, ICER was estimated to be € 2657/ QALY gained. At a threshold of € 39419 the intervention had a 91% chance of being cost effective.
Rehabilitation	van Eeden et al., 2015, Nether-lands.	Adult stroke patients with depressive symptoms, mean age 60-62 years, *n*=61.	Individually tailored four- months cognitive behavioral therapy including 10-12 sessions with a certified healthcare psychologist and 3 sessions with an occupational therapists or movement therapist. Focus on goals related to daily activities.	At 12 months, compared to an individually tailored computerized training program focused on cognitive functions, the intervention resulted in poorer effects on **depression** and **anxiety** and slightly more **QALYs** gained (0.01). Included costs were: intervention, health care, private, informal care, productivity. The intervention cost was € 1214 (95%CI −5677 to 1930). Total costs were non-significantly lower in the intervention group (€ 8664) compared with control (€ 10741). At a threshold of € 42974 per QALY gained, the intervention had a 76% chance of being cost effective.
Rehabilitation	Woods et al., 2012, UK.	Persons with mild or moderate dementia, and their caregivers, *n*=488 dyads.	Reminiscence groups including 12 two-hour weekly sessions held in social settings. The aim is to promote communication and well-being by drawing on early memories using music, video, art cooking. Focus on themes related to various aspects of life e.g., childhood, working life, leisure. The first 3 months was followed by a maintenance phase including monthly sessions over 7 months.	At 10 months, compared to usual care, the intervention showed no effect on **QALYs.** The results indicated significantly more **anxiety** for carers in the intervention group. Included costs were: intervention, health care, social care, volunteer services, private costs. The intervention cost was € 1417per dyad. The total mean cost was higher in the intervention group and there was no difference in effect. Therefore, a full economic evaluation was not performed.
Rehabilitation/ Reablement	Zingmark et al., 2017.	Older people with bathing disability. Hypothetical cohort.	Rehabilitation that focused on supporting the person in improving her/his ability to perform self-care tasks related to bathing, e.g., by practical training sessions in the person´s home, environmental adaptations, provision of technical aids. In all, three sessions over three weeks.	The intervention was compared to usual care over 8 years. The intervention effect, based on a previous trial, was calculated to be a 1.4 increased chance for recovery from severe to moderate dependency one year from baseline. Included costs were: intervention, social care, special housing, health care, informal care. The intervention cost was €135 per participant on average. The incremental effect on **QALYs** at 8 years was 0.052 (2.211 vs. 2.263). The incremental effect on societal costs at 8 years was € 2533 lower in the intervention group (€ 97297) than the control group (€ 99830).

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