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# Leadership development

An evidence review

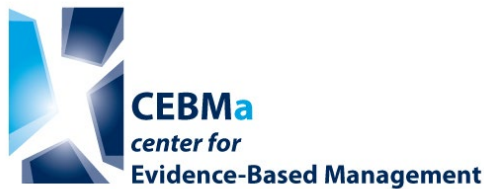
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## About CEBMa

The Center for Evidence-Based Management (CEBMa) is the leading authority on evidence-based practice in the field of management and leadership. It is an independent non-profit foundation providing support and resources to managers, leaders, consultants, facilitators or instructors, academics and others interested in evidence-based practice and decision-making. It enjoys the support of prominent universities including Stanford, Carnegie Mellon, the Australian National University, and the Free University of Amsterdam.



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# 1 Introduction

## Rationale for this review

Good people managers are an essential component of organisational success, and leadership training is seen as an important way in which to develop and enhance the capabilities of managers. However, such training varies considerably in its focus, delivery and effectiveness. For this reason, we conducted an evidence review to understand what is known in the scientific literature about the attributes of effective leadership training programmes.

## What is a rapid evidence assessment?

Evidence reviews come in many forms. One of the best known is the conventional literature review, which provides an overview of relevant scientific literature published on a topic. However, a conventional literature review's trustworthiness is often low: clear criteria for inclusion are often lacking and studies are selected based on the researcher's individual preferences. As a result, conventional literature reviews are prone to bias. This is why we use 'rapid evidence assessments' (REAs). REAs use a specific research methodology to identify the most relevant studies on a specific topic as comprehensively as possible, and select appropriate studies based on explicit criteria. In addition, the methodological quality of the studies included is assessed by two independent reviewers. In contrast to a conventional literature review, an REA is transparent, verifiable and reproducible, and, as a result, the likelihood of bias is considerably smaller.

## Main question: What does the review answer?

**What is known in the research literature about the effectiveness of leadership training programmes? In addition, what are the characteristics of effective leadership training programmes?**

Other issues that follow from these questions are:

- 1 What is leadership?
- 2 How can leadership be measured?
- 3 What is the effect of leadership training?
- 4 What are the characteristics of effective leadership training programmes?

# 2 Methods

## Search strategy: How was the research evidence sought?

The following four databases were used to identify studies: ABI/INFORM Global, Business Source Premier, PsycINFO and the database of the Education Resources Information Centre (ERIC). The following generic search filters were applied to all databases during the search:

- 1 scholarly journals, peer-reviewed
- 2 published in the period 1980 to 2023 for meta-analysis and 2012 to 2022 for controlled and/or longitudinal studies
- 3 articles in English.

A search was conducted using combinations of different search terms, such as ‘leadership’, ‘management’, ‘training’ and ‘development’. We conducted 53 different search queries and screened the titles and abstracts of more than 700 studies. An overview of all search terms and queries is provided in Appendix 1.

The search was first conducted for an evidence review in 2013. This was then re-run to update the review with studies published since then in 2020 and again in 2022.

### **Selection process: How were studies selected?**

Study selection took place in two phases. First, the titles and abstracts of the 700+ studies were screened for their relevance to this REA. In case of doubt, lack of information or disagreement, the study was included. Duplicate publications were removed. This first phase yielded 25 (2013), 21 (2019) and 15 (2022) studies. Second, studies were selected based on the full text of the article according to the following inclusion criteria:

- 1 type of studies: only quantitative, empirical studies
- 2 design: only meta-analyses and controlled/longitudinal studies
- 3 measurement: only studies in which relationships between learning outcomes, contextual factors, antecedents and leadership training were quantitatively measured
- 4 context: only studies related to workplace settings.

This second phase yielded 17 studies (in 2013), plus 14 studies (2020) and 12 studies (2022), making a total of 43. An overview of the selection process is provided in Appendix 2.

### **Data extraction: What data was extracted?**

Data extraction involves the collation of the results of the studies included. From each study we extracted and interpreted information relevant to the review question, such as year of publication, research design, sample size, population (eg industry, number of employees), possible moderators or mediators, main findings, effect sizes and limitations. An overview of all studies included is provided in Appendix 3.

### **Critical appraisal**

In almost any situation, it is possible to find a scientific study to support or refute a theory or a claim. Thus it is important to determine which studies are trustworthy (ie valid and reliable) and which are not. The trustworthiness of a scientific study is first determined by its methodological appropriateness. For cause-and-effect claims (ie if we do A, will it result in B?), a study has a high methodological appropriateness when it fulfils the three conditions

required for causal inference: co-variation, time-order relationship and elimination of plausible alternative causes (Shaughnessy and Zechmeister, 2006).

A study that uses a control group, random assignment and a before-and-after measurement is therefore regarded as the 'gold standard'. Non-randomised studies and before-after studies come next in terms of appropriateness. Cross-sectional studies (surveys) and case studies are regarded as having the greatest chance of showing bias in the outcome and therefore fall lower in the ranking in terms of appropriateness. Meta-analyses in which statistical analysis techniques are used to pool the results of controlled studies are therefore regarded as the most appropriate design.

To determine the methodological appropriateness of the included studies' research design, the classification system of Shadish et al (2002), and Petticrew and Roberts (2006) was used. The following four levels of appropriateness were used for the classification:

Design	Level
Systematic review or meta-analysis of randomised controlled studies	AA
Systematic review or meta-analysis of controlled before-after studies	A
Randomised controlled study	
Systematic review or meta-analysis of non-controlled and/or before-after studies	B
Non-randomised controlled before-after study	
Interrupted time series	
Systematic review or meta-analysis of cross-sectional studies	C
Controlled study without a pretest or uncontrolled study with a pretest	
Cross-sectional study	D

It should be noted, however, that the level of methodological appropriateness as explained above is only relevant in assessing the validity of a cause-and-effect relationship that might exist between a predictor/driver (organisational culture) and its outcomes (performance), which is the purpose of this review.

In addition, a study's trustworthiness is determined by its methodological quality (its strengths and weaknesses). For instance, was the sample size large enough and were reliable measurement methods used? To determine methodological quality, all the studies included were systematically assessed on explicit quality criteria. Based on a tally of the number of weaknesses, the trustworthiness was downgraded, and the final level determined as follows: a downgrade of one level if two weaknesses were identified; a downgrade of two levels if four weaknesses were identified, etc.

Finally, the effect sizes were identified. An effect (eg a correlation, Cohen's *d* or omega) can be statistically significant but may not necessarily be of practical relevance: even a trivial effect can be statistically significant if the sample size is big enough. For this reason, the effect size - a standard measure of the magnitude of the effect - of the studies included was assessed. To determine the magnitude of an effect, Cohen's rules of thumb (Cohen, 1988) were applied. According to Cohen a 'small' effect is an effect that is only visible through careful examination. A 'medium' effect, however, is one that is 'visible to the naked eye of the careful observer'. Finally, a 'large' effect is one that anybody can easily see because it is substantial.

### **Critical appraisal: What is the quality of the studies included?**

The overall quality of the 43 studies included in this review is moderate to high: 26 studies were graded level B or higher. An overview of all the studies included and information regarding year of publication, research design, sample size, population, main findings, effect sizes and limitations is provided in Appendix 3.

## **3 Main findings**

### **Question 1a: What is leadership?**

In the domain of management and organisations, the term, 'leadership' is a popular term. In management books as well as in the scientific literature, the effect of leadership is widely discussed and studied. Amazon offers thousands of management books with 'leadership' in the title, and the research database ABI/INFORM contains more than 15,000 peer-reviewed papers on this topic. In fact, both scholars and practitioners view leadership as an important, if not fundamental, driver for organisational performance (Pfeffer, 2015). Despite the large number of publications, however, there is no consensus of what 'leadership' entails. As a result, there are many definitions of leadership available. For example, the *Oxford English Dictionary* defines leadership as "the ability to be a leader or the qualities a good leader should have", whereas Wikipedia refers to leadership as "a process of social influence in which a person can enlist the aid and support of others in the accomplishment of a common task".

Sometimes the term 'leadership' is limited to "personal influence resulting in enthusiastic commitment of followers" (Schyns, 2013). For example, some management thinkers simply define leadership as "the capacity to translate vision into reality" (Warren Bennis), or "empowering others" (Bill Gates). In addition, there is an ongoing controversy regarding the distinction between leadership and management. Conventional wisdom has it that managers are concerned with how things get done, whereas leaders build commitment and vision (Kotter, 1990). However, as Yukl (1989) stated: "Nobody has proposed that managing and leading are equivalent, but the degree of overlap is a point of sharp disagreement (Collins, 2002)." In this review, however, the terms 'leadership' and 'management' are used interchangeably.

The lack of a widely accepted definition of leadership and what it entails complicates research on the effect of leadership training programmes. Leadership training programmes use



a plethora of definitions and core attributes of leadership, which makes a robust and comparable evaluation of their impact difficult.

## Question 2: How can leadership be measured?

There are many assessment tools and questionnaires available that claim to measure leadership. Most of these tools focus on a specific element or type of leadership, such as the Leadership Style Questionnaire (Northouse, 2011) and the Servant Leadership Behaviour Scale (Sendjaya, 2008). A recent systematic review that evaluates the psychometric properties of 17 leadership scales found that the majority lack some degree of rigor. Partly for this reason, most studies included in this review don't measure leadership as such, but rather evaluate the impact (transfer) of leadership training programmes by using Kirkpatrick's model (Collins, 2001; Frich, 2015). Kirkpatrick's assessment model comprises four levels, presented as a sequence:

- 1 reaction: what participants think and feel about the training programme
- 2 learning: the resulting increase in knowledge, skills and change attitudes
- 3 behaviour: the resulting change in practice and behaviour
- 4 results: the resulting organisational benefits (eg performance, service delivery, clinical outcomes).

## Question 3: What is the effectiveness of leadership training programmes?

**Finding 1: Overall, leadership training has a moderate positive effect, but this effect varies across participants and settings (level AA)**

**Finding 2: The effectiveness of leadership training has somewhat improved over the past decades (level A)**

**Finding 3: The effects of leadership training remain stable over time (level A)**

Overall, leadership training and development programmes have a moderate positive effect on a wide range of outcomes (Au, 2005; Avolio, 2009; Baron, 2016; Cohrs et al, 2020; Collins, 2004; Eden et al, 2000; Lacerenza, 2017; Mesmer, 2010; Middleton et al, 2019; Reyes, 2019; Seeg et al, 2022; Taylor et al, 2009). This result is largely replicated across studies irrespective of the source of evaluation (self, superior, peer or subordinate ratings) or study designs (meta-analyses and controlled/longitudinal studies). Surprisingly, although there have been numerous innovations in leadership theory and training techniques, the effectiveness of leadership training seems to have only slightly improved over the past 20 years (Lacerenza, 2017; Powell and Yalcin, 2010). The effects on learning outcomes, however, tend to be larger than the effects on performance outcomes (Frich, 2015; Taylor et al, 2005).

There are some indications that the effect of leadership training may be more effective in public organisations (An et al, 2019) and may have a slightly larger impact for female managers than for male managers (An and Meier, 2021). In addition, it was found that the effect of leadership training is subject to diminishing returns - that is, managers who already use good leadership techniques are unlikely to gain as much from additional training as those who do not use these techniques (An and Meier, 2021; An et al, 2019; Cohrs et al, 2020).

Finally, a meta-analysis of randomised controlled studies showed that, although effects on declarative knowledge decayed over time, training effects on skills and leadership behaviour remain stable or even increase (Taylor et al, 2005). This finding was confirmed by a recent longitudinal study that found strong positive long-term effects regarding the transfer of leadership behaviour (Seeg et al, 2022).

**Finding 4: The evidence on the economic return on investment of leadership training is unclear (level B)**

The studies included in this REA provide limited information on the economic utility or return on investment (ROI) of leadership training. A meta-analysis that attempted to calculate the ROI of leadership training cautioned that the financial returns are unclear, especially for higher-level managers and leaders (Morrow et al, 1997). It is therefore recommended by some authors to limit the expenses through, for example, controlling additional expenses such as travel and accommodation, and avoiding expensive ‘high-end’ training.

**Question 4: What is the effectiveness of leadership training programmes?**

The studies included in this review show a large variation of effectiveness of the training programmes. These findings suggest that the effect of leadership training is moderated and/or mediated by several factors, such as delivery and implementation characteristics (Lacerenza, 2017; Morrow et al, 1997). Below, an overview of moderators and mediators is provided.

**Finding 5: Leadership training programmes with the following characteristics tend to be more effective**

**Start with a ‘training needs analysis’ (level B)**

Regarding the training or learning content of leadership training programmes, the studies included in this review indicate that a careful training needs analysis (eg through a survey, interview, focus group, critical incidents) before the start of the programme tends to increase its effectiveness (Lacerenza, 2017; Leskiw, 2007; Mesmer, 2010; Salas, 2012, Seeg et al, 2022; Taylor et al, 2005). More specifically:

- 1 Programmes designed on the basis of an analysis of tasks and skill requirements and skills gaps are more effective than generic untailed programmes.
- 2 ‘Training needs’ analysis has a positive impact on the motivation of trainees to learn.
- 3 Learning transfer is greater when trainees set clear and specific learning goals.

**Focus on general management skills and (soft) interpersonal skills (Level B)**

A meta-analysis of controlled studies (Taylor et al, 2009) indicates that skills that seem to transfer best to leader behaviour seem to be general management skills (eg goal-setting, performance appraisal, time management) and, to a lesser extent, interpersonal skills (eg listening, questioning, negotiating, mentoring). However, it was found that ‘off the shelf’ courses provided by private training providers in the UK often show serious omissions when it comes to teaching these skills (Yearley, 2017).

**Duration and repetition (level A)**

In relation to design, several meta-analyses and high-quality studies indicate that leadership training and development programmes should be of reasonable length (at least three days or longer) and repeated periodically to be effective (eg Lacerenza, 2017; Taylor et al, 2005). In addition, leadership training programmes with spaced distribution are more effective than one-off trainings (Au, 2005). However, long and complex courses may not be required to achieve positive change; short (several days), punchy courses with clear objectives may well be as effective (Lyons, 2018; Reyes, 2019).

### **Use multiple learning and evidence-based instruction methods (level A)**

Several studies report that effective training programmes are characterised by the use of a combination of didactic learning, tutorials and reflective learning (Lyons, 2018). In addition, these programmes tend to use multiple instruction methods, such as lectures, group work, and action learning projects (Frich, 2015; Lacerenza, 2015; Steinert et al, 2012). In addition, it was found that training with an evidence-based design not only has larger short-term effects but also tends to be more effective in the long term (Seeg et al, 2022). An overview of evidence-based principles and a checklist can be found in Salas (2012, tables 2 and 3).

### **Provide opportunity to practise (level A)**

Although the use of multiple methods tends to be effective, the training programme should clearly include opportunities for practice, linked to real-world situations or trainee-generated scenarios (Frich, 2015; Lacerenza, 2015; Mianda, 2018; Steinert et al, 2012; Seeg et al, 2022). This type of training is often referred to as ‘experiential’, ‘problem-based’ or ‘action’ learning. In fact, in the domain of evidence-based education, there are a large number of studies that show, in general, experiential learning tends to be more effective than traditional learning, especially when it concerns the teaching of practical skills, soft skills and vocational knowledge (Lista et al, 2022). For example, several systematic reviews and longitudinal studies indicate that courses that include (simulations of) real-life situations and social interaction yield better outcomes and have a larger (positive) effect on students’ performance when compared with traditional teaching methods (Baron, 2016; Boet, 2014; Fung, 2015; Norman, 2012; Zelechowski, 2017). It was found, however, that the positive effect of experiential learning is mediated by participants’ perceptions of psychological safety (Cajiao and Burke, 2016; see also below).

### **Create a safe learning climate and provide recognition and support (level A)**

For leadership training and development programmes to be effective, it seems important, as is the case for other forms of training, to create and maintain a safe learning climate that supports the transfer to the workplace of what was learned. Recognition, feedback, mentorship and support from the organisation and the supervisor or peers for acquiring and applying new skills can motivate trainees to transfer what they learned to their day-to-day work behaviour (Lacerenza, 2017; Leskiw, 2007; Steinert et al, 2012; Taylor et al, 2005). As such, leadership training should not be treated as a one-shot event. On the contrary, leadership development should be strongly and systematically integrated and communicated in the workplace climate and processes.

## 4 Conclusion

Leadership training programmes are effective, but this effect is contingent on various design, delivery, and implementation characteristics. This REA supports the use of needs analysis, a focus on general management skills and interpersonal skills, multiple delivery methods, opportunity to practise, spaced training sessions and organisational support.

### Limitations

This REA aims to provide a balanced assessment of what is known in the scientific literature about the characteristics of effective leadership training programmes by using the systematic review method to search and critically appraise empirical studies. However, to be 'rapid', concessions were made in relation to the breadth and depth of the search process, such as the exclusion of unpublished studies, the use of a limited number of databases and a focus on meta-analyses and controlled/longitudinal studies published in the period 1995 to 2022. As a consequence, some relevant studies may have been missed.

A second limitation concerns the critical appraisal of the studies included, which did not incorporate a comprehensive review of the psychometric properties of the tests, scales and questionnaires used.

Finally, this REA focused only on quantitative studies, that is, studies in which the link between leadership programmes and performance/organisational outcomes was quantitatively measured. For this reason, findings from quantitative studies were not reported. As a consequence, qualitative findings that are relevant for practice may have been missed.

Given these limitations, care must be taken not to present the findings presented in this REA as conclusive.

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## Appendix 1: Search terms and hits

Web of Science, ABI/Inform Global, Business Source Elite, Business Source Elite			
Peer-reviewed, scholarly journals, June 2013			
Search terms	WSc	ABI	BSP
S1. ab(leader*) AND ab(training)	5,664	1,675	2,416
S2. ab(meta-anal*) AND S1	30	6	6
S3. ab("systematic review") AND S1	37	4	2
S4. ab("leader* training")	438	181	319
S5. ab("meta-anal*") AND S4	1	1	1
S6. ab(review) AND S4	36	12	17
S7. ab(leader*) AND ab(develop*)	23,453	9,734	12,515
S8. ab("meta-anal*") AND S7	90	16	17
S9. ab(review) AND S7	2,600	709	972
S10. ab("systematic review") AND S7	100	13	9
S11. ab("leader* develop*")	1,510	672	1,131
S12. ab("meta-anal*") AND S11	5	3	2
S13. ab(review) AND S11	108	52	122
S14: S11 AND filter WSc: management OR psychology applied OR health care sciences services OR nursing	53	-	-
S15. ab("systematic review") AND S11	5	1	0
S16. ab(leader*) AND ab(course*)	2,130	794	1,046
S17. ab("meta-anal*") AND S16	0	0	0
S18. ab(review) AND S16	215	45	186
S19. ab("systematic review") AND S16	4	0	0
S20. ab("leader* course")	39	14	25
S21. ab(manag*) AND ab(training)	44,064	8920	12,703
S22. ("meta-anal*") AND S21	280	20	23
S23. ab(review) AND S21	5,578	608	969

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S24. ab("systematic review") AND 21	323	12	8
S25. ab("manag* training")	1,963	790	1,321
<b>S26. ab("meta-anal*") AND S25</b>	<b>20</b>	<b>6</b>	<b>6</b>
S27. ab(review) AND S25	156	48	120
<b>S28. S25 AND filter: management OR psychology applied OR health care sciences services OR nursing</b>	<b>48</b>	-	-
<b>S29. ab("systematic review") AND S25</b>	<b>11</b>	<b>1</b>	<b>0</b>
S30. ab(manag*) AND ab(develop*)	349,722	6,4872	4,639
S31. ab("meta-anal*") AND S30	1,395	92	38
S32. ab(review) AND S30	50,492	5,119	3,744
S33. ab("systematic review") AND S30	1,652	63	48
S34. ab("manag* develop*")	1,694	1,481	2,639
<b>S35. ab("meta-anal*") AND S34</b>	<b>5</b>	<b>0</b>	<b>0</b>
S36. ab(review) AND S34	120	128	744
<b>S37. S34 AND filter: management OR psychology applied OR health care sciences services OR nursing</b>	<b>35</b>	-	-
<b>S38. ab( "systematic review") AND S34</b>	<b>2</b>	<b>0</b>	<b>0</b>
S39. ab(manag*) AND ab(course*)	38,501	4,319	6,830
<b>S40. ab("meta-anal*") AND S39</b>	<b>178</b>	<b>2</b>	<b>5</b>
S41. ab(review) AND S39	7.384	273	455
<b>S42. ab("systematic review") AND S39</b>	<b>204</b>	<b>2</b>	<b>1</b>
S43: ab("manag* course*")	652	193	285
<b>S44. ab("meta-anal*") AND S43</b>	<b>6</b>	<b>0</b>	<b>0</b>
S45. ab(review) AND S43	69	10	25

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S46. ab(“systematic review”) AND S43	5	0	0
S47. ab(“leader* training”) AND (“health care” OR doctor* OR nurs* OR physician OR hospital)	77	13	35
S48. ab(“manag* training”) AND ab(“health care” OR doctor* OR nurs* OR physician OR hospital)	271	173	191
S49. ab(“meta-anal*”) AND S48	3	0	0
<b>Total</b>	<b>1,161</b>	<b>126</b>	<b>202</b>

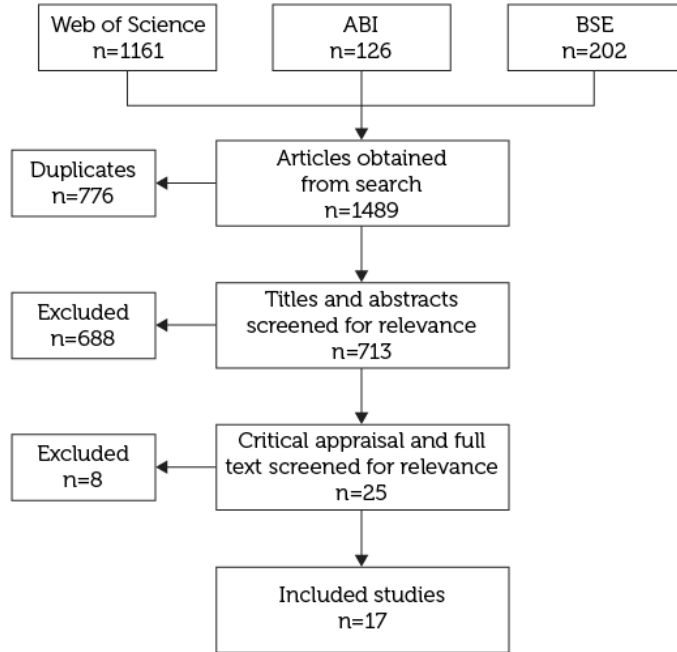
<b>ABI/Inform Global, Business Source Elite, PsycINFO, ERIC and MEDLINE</b>					
<b>Peer-reviewed, scholarly journals, November 2019</b>					
<b>Search terms</b>	<b>ABI</b>	<b>BSP</b>	<b>PSY</b>	<b>ERIC</b>	<b>Medline</b>
S1: ti(leader*) OR ti(manage*)	121,639	141,529	62,223	22,143	415,236
S2: ti(train*) OR ti(develop*)	95,185	123,695	172,020	76,214	707,490
S3: S1 AND S2	7,753	8,494	5,010	2,805	10,077
S4: S3 AND filter MAs, SRs or reviews	<b>37</b>	<b>32</b>	<b>64</b>	<b>12</b>	<b>112*</b>

*\*additional (database-specific) filters were used.*

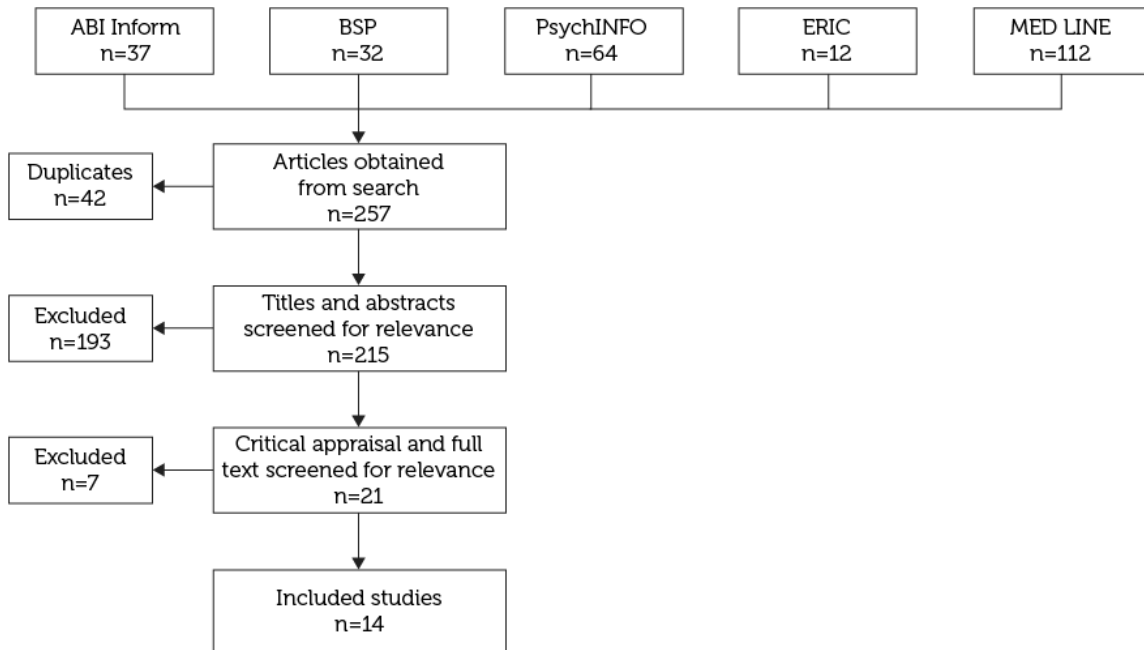
<b>ABI/Inform Global, Business Source Elite, PsycINFO, and ERIC</b>				
<b>Peer-reviewed, scholarly journals, December 2022</b>				
<b>Search terms</b>	<b>ABI</b>	<b>BSP</b>	<b>PSY</b>	<b>ERIC</b>
S1: ti(leader*) OR ti(manage*) > 2019	18,949	25,178	9,338	4,127
S2: ti(train*) OR ti(develop*) > 2019	14,757	22,567	21,827	11,124
S3: S1 AND S2	932	1,514	596	465
S4: S3 AND filter MAs, SRs or reviews	<b>12 (nr)</b>	<b>22 (2)</b>	<b>12 (nr)</b>	<b>5 (2)</b>
S5: S3 AND filter longitudinal studies > 2012	<b>214</b>	<b>110</b>	<b>47</b>	<b>134</b>

## Appendix 2: Study selection

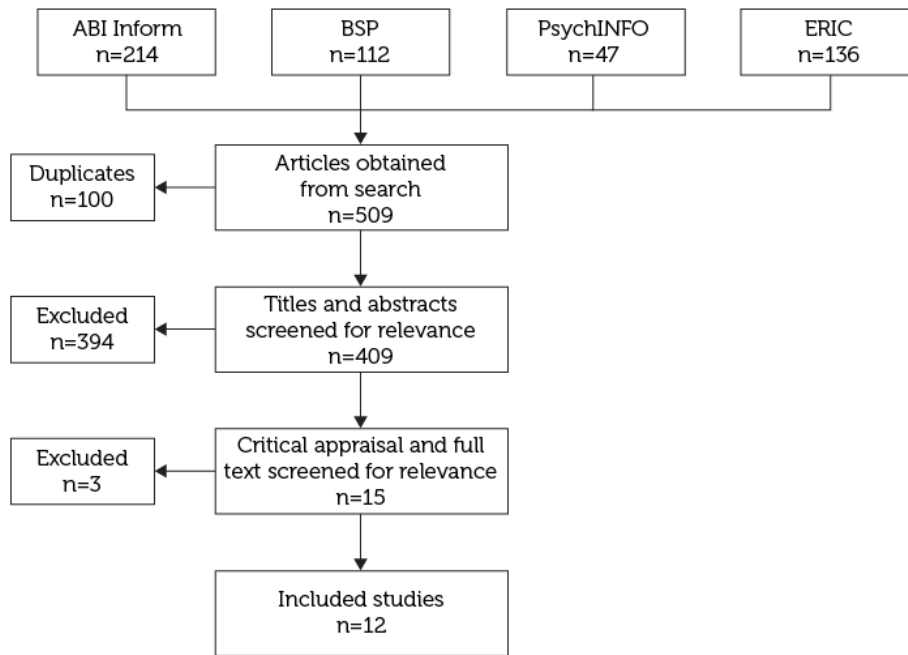
### Selection of studies 2013



### Selection of studies 2020



Selection of studies 2022



### Appendix 3: Data extraction table

1st author and year	Design and sample size	Sector/population	Main findings	Effect sizes	Limitations	Level
1. An, 2019	Randomised controlled study n=506	Danish leaders from private and public organisations	<p>1. The effect of transformational leadership training on managers' transformational leadership behaviour was only effective in public organisations (not in private organisations).</p> <p>2. The effect of transactional leadership training on managers' transactional leadership behaviour is NOT larger in private organisations compared with public organisations.</p> <p>3. The effect of combined training (transformational and transactional) is equal in both sectors.</p> <p>4. In the public sector, the influence of leadership training is subject to diminishing returns, that is, managers who extensively use transformational leadership techniques are unlikely to gain as much from additional training as those who did not use these techniques.</p> <p>* Training consisted of four seven-hour classes over a period of one year based on a 600-page curriculum and coursework between meetings.</p>	<p>1. not provided (effect training private sector: negative and ns)</p> <p>2. difference=ns</p> <p>3. difference=ns</p>	no serious limitations	A

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<p>2. An, 2012</p>	<p>Randomised controlled study n=368</p>	<p>Leaders from public organisations in Denmark</p>	<p>0. At baseline, employees perceive that women managers are more likely to use transformational leadership and are more likely to make use of verbal rewards (rather than material rewards).</p> <p>1. Transformational leadership training has a (slightly) larger impact for female leaders than for male leaders.</p> <p>2. Transactional leadership training does not have a larger impact for male leaders than for female leaders.</p> <p>3: The impact of transformational leadership training is larger for leaders with lower levels of pre-training transformational leadership behaviour.</p> <p>4: The impact of transactional leadership training is larger for leaders with lower levels of pre-training transactional leadership behaviour.</p> <p>* Training consisted of four seven-hour classes over a period of one year based on a 600-page curriculum and coursework between meetings.</p>	<p>1. not provided but appear to be small</p> <p>2: ns</p> <p>3 &amp; 4: not provided</p>	<p>no serious limitations</p>	<p>A</p>
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<p>3. Au, 2005</p>	<p>Meta-analysis k=58</p>	<p>Working population and vocational trainees</p>	<ol style="list-style-type: none"> <li>1. There is a moderate effect size of overall leadership training programmes.</li> <li>2. Leadership training programmes with a theoretical basis (a) were more effective, especially the application of Fiedler's contingency theory (b).</li> <li>3. Leadership training programmes with spaced distribution are more effective (a) than one-off trainings (b).</li> <li>4. Leadership training programmes using lower levels of (a) evaluation criteria, (b) subjective criteria, (c) self-reported measurements and (d) multiple-source evaluation criteria, as well as (e) weak experimental designs, upwardly bias the results.</li> </ol>	<p>1) Overall d=.64 2a) d=.74 2b) d=1.10 3a) d=.65 3b) d=.50 4a) Reaction d=.82; Learning d=.71; Behaviour d=.40; Results d=.50 4b) Subjective only d=.68; Objective only d=.42. With objective d=.44 4c) Self d=.70; Others d=.65; Both d=.69 4d) Single d=.51; Multiple d=.96 4e) SGPP d=.80 POWC d=.68 PPWC d=.46 Random d=.37; Non-random d=.72</p>	<p>Quality of the included studies not assessed</p>	<p>A</p>
<p>4. Avolio, 2009</p>	<p>Meta-analysis, including experiments and quasi-experiments k=13/28</p>	<p>various, profit/military</p>	<p>Training or development interventions have a moderate effect on (1) affective, (2) behavioural and (3) cognitive outcomes.</p>	<p>1. d=.39 2. d=.43 3. d=.62</p>	<p>Conclusions are not drawn on development interventions in particular, but on experimental leadership</p>	<p>AA</p>

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					interventions in general.	
5. Ayeleke, 2019	systematic review including various low-quality designs  k=19	healthcare	Quantitative studies (n=3) showed that participation of health managers in a leadership development programme resulted in (some) improvement in leadership practices.	No standardised effect sizes were reported (only unstandardised MDs)	Criteria for quality appraisal not provided  Limited nr of quantitative studies	C
6. Baron, 2016	controlled cohort study with repeated measures  n=143	French-Canadian middle managers who had voluntarily signed up for the leadership development programme	1. Participation in a leadership development programme based on action learning principles is positively associated with authentic leadership development.	1. after completion $\eta^2=.40$ ; after second year $\eta^2=.43$ ; after third year $\eta^2=.59$	concerns self-report	B
7. Blume, 2010	Meta-analysis including field and lab studies  k=89 studies,	students/managerial/non-managerial, mainly USA and Canada	<ol style="list-style-type: none"> <li>1. Learning transfer is related to trainee characteristics (eg cognitive ability, experience, personality, motivation), work environment factors (ie support, climate, constraints/opportunity), training interventions, learning outcomes (ie knowledge, self-efficacy), and trainee reactions.</li> <li>2. The predictor-transfer relationships after removing same-source and same-measurement-context (SS/SMC) bias is weaker.</li> <li>3. Regarding transfer measurement, predictor-transfer relationship is stronger in the case of (a) no time lag between training and the transfer measure, (b) self-measures compared with non-self (ie</li> </ol>	<p>1) See table 1 for complete overview. Examples: Cognitive ability <math>\rho=.37</math> Neuroticism <math>\rho=-.19</math> Post-training self-efficacy <math>\rho=.22</math></p> <p>2) See table 1</p>	Concrete and elaborate information on the variables is lacking.  Large number of variables	A

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			<p>peer or objective) measures, and (c) use as measurement of transfer compared with effectiveness.</p> <ol style="list-style-type: none"> <li>4. In general predictor-transfer relationships are stronger for open than for closed skills.</li> <li>5. Predictor-transfer relationships are stronger in the laboratory context for cognitive ability and post-training self-efficacy; for pre-training self-efficacy, motivation, post-training knowledge and goal-setting the relationship is stronger in the field context.</li> <li>6. For all predictors except post-training knowledge the predictor-transfer relationships were stronger in a published than an unpublished study.</li> <li>7. The longer the length of time between training and the transfer measure the weaker the predictor-transfer relationships for (a) post-training knowledge and (b) post-training self-efficacy but not for (c) pre-training self-efficacy, (d) motivation and (e) work environment (ns).</li> <li>8. There is a moderate relationship between trainees' rating versus (a) supervisor's and (b) peers' assessment of transfer and (c) a large relationship between measures at different times by the same source.</li> </ol>	<p>Example: Post-training self-efficacy SS/SMC <math>\rho=.46</math> Not SS/SMS <math>\rho=.20</math></p> <ol style="list-style-type: none"> <li>3) See table 2. a) Example post-training self-efficacy Time lag <math>\rho=.11</math> no time lag <math>\rho=.38</math></li> <li>b) Example Motivation Self <math>\rho=.33</math> other/objective <math>\rho=.11</math></li> <li>c) Example Motivation Use <math>\rho=.36</math> Effectiveness <math>\rho=.10</math></li> <li>4) See table 3.</li> <li>5) See table 4.</li> <li>6) See table 5.</li> <li>7) See table 6. a) <math>\beta=-.25</math> b) <math>\beta=-.64</math> c) <math>\beta=-.08</math> (ns) d) <math>\beta=-.29</math> (ns) e) <math>\beta=.07</math> (ns)</li> <li>8) See table 7 a) <math>\rho=.28</math> b) <math>\rho=.26</math> c) <math>\rho=.57</math></li> </ol>		
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<p>8. Brown, 2016</p>	<p>quasi-experimental study (randomisation at the group level)  n=172</p>	<p>Canadian public sector employees enrolled in a managerial development programme</p>	<p>1. Participants who set behavioural outcome goals, behaviourally specific goals, and rank-ordered behavioural goals have NO higher learning transfer (based on self and workplace observer behavioural observation scales) relative to those urged to do your best.*</p> <p>2. Participants who set behavioural outcome goals, behavioural-specific goals, and rank-ordered behavioural goals have NO higher learning transfer (assessed using self-report surveys) relative to those urged to do your best.</p> <p>Thus, providing managerial development participants with the list of key behaviours via behavioural observation scales, and then urging them to do their best to use these back at work, may be sufficient to enhance efficacy and transfer.</p> <p>*Note: In fact, there was some evidence to the contrary: do-your-best participants had higher transfer than those who set rank-ordered behavioural goals or behavioural-specific goals.</p>	<p>1. ns 2. ns</p>	<p>no serious limitations</p>	<p>B+</p>
<p>9. Cajiao, 2016</p>	<p>Quasi-experimental study  n=246</p>	<p>students from a business school in Colombia</p>	<p>1. As the instructional method includes greater social interaction** and reflective activities, students' reflective and dialogical activities increase.</p> <p>2. Students' perceptions of psychological safety partially mediates the relationships between instructional method and students' reflective and dialogical activities.</p> <p>* the leadership course was offered over a 16-week period</p> <p>** low social interaction=lecture only with reading assignments; high social interaction=use of role-plays, managerial simulations, projects, and carefully structured experience-based exercises.</p>	<p>moderate interaction - overall learning behaviours β=.04 ns</p> <p>high interaction - overall learning behaviours β=.65</p> <p>overall learning behaviours low vs mod d=.03 mod vs high d=1.17 low vs high d=1.31</p>	<p>no serious limitations</p>	<p>B</p>

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10. Ciucur, 2012	Quasi-experiment n=30	managerial, automotive industry, Romania	1. Significant differences for emotional stability and social boldness.	not reported	Small sample	B
11. Collins, 2001	Systematic review k=54	Managers, leaders and/or executives	<ol style="list-style-type: none"> <li>Thirty per cent of the studies reported organisational performance improvement as outcome. Seventy per cent measured learning.</li> <li>Eighty-one per cent of studies with performance-level outcomes measured system performance, while 19% addressed financial-level performance as the outcome variable.</li> <li>Strategic leadership is most frequently researched leadership development content area (33%), then employee development (20%) and supportive environment (15%).</li> <li>Formal training is primary leadership development intervention (41%), then job assignments (32%).</li> </ol>	Not reported	Quality of the included studies unclear  Qualitative review	C
12. Collins, 2004	Meta-analysis k=83 Post-test only control group (POWC), pre-test post-test with control group (PPWC), single group pre-test post-test (SGPP), correlational	Managers, leaders, executives, officers, supervisors, and/or foremen  Various sectors	<ol style="list-style-type: none"> <li>Leadership development programmes are positively associated with knowledge objective outcomes.</li> <li>Leadership development programmes are positively associated with expertise objective outcomes.</li> <li>Leadership development programmes are positively associated with expertise subjective outcomes.</li> <li>Leadership development programmes are positively associated with system objective outcomes.</li> </ol>	<p>1) POWC .96 CI95 .82 1.12 SGPP .1.36 CI95 1.18 1.56</p> <p>2) POWC .54 CI95 .14 .95 PPWC .35 CI95 .20 .50 SGPP 1.01 CI95 .87 1.15</p> <p>3) POWC .41 CI95 .25 .58 PPWC .40 CI95 .20 .61 SGPP .38 CI95 .30 .46</p> <p>4) POWC .39 CI95 .19 .59</p>	Quality of the included studies unclear  Wide CIs	B

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<p>13. Cohrs, 2020</p>	<p>controlled before-after study with a 3-month post-test n=38 (exp) vs 58 (contr)</p>	<p>leaders from a German textile company and two accounting firms</p>	<ol style="list-style-type: none"> <li>1. Subordinates rated the participating leaders' transformational leadership higher three months after the intervention.</li> <li>2. Subordinates did not rate the participating leaders' impression-leaving communicator style higher three months after the intervention.</li> <li>3. Subordinates rated the participating leaders' attentive communicator style higher three months after the intervention.</li> <li>4. Leaders with an initial low or middle level of transformational leadership behaviour benefited more from training than leaders with a high level of transformational leadership, in comparison with the leaders of the control group.</li> <li>5. Leaders with an initial low or middle level of attentive communicator style benefited more from training than leaders with a high level of attentive communicator style, in comparison with the leaders of the control group.</li> </ol>	<p>1. <math>B=.29</math> 2. <math>B=ns</math> 3. <math>B=.29</math> 4. low pre-post <math>d=.55</math> middle pre-post <math>d=1.26</math> high pre-post <math>d=.08</math> 5. low pre-post <math>d=.52</math> middle pre-post <math>d=.49</math> high pre-post <math>d=ns</math></p>	<p>no serious limitations</p>	<p>B</p>
<p>14. Cummings, 2008</p>	<p>Systematic review k=9?</p>	<p>Nurses in leadership positions</p>	<p>All nine studies found positive results for (mostly) self-rated leadership and observed leadership.</p>	<p>not reported</p>	<p>Design of included studies unclear</p>	<p>C</p>
<p>15. DeRue, 2012</p>	<p>Cohort study (9 months) n=173</p>	<p>MBA students, various, USA</p>	<p>Small positive effect on leadership development.</p>	<p>not reported</p>	<p>- Same-source bias - Low incremental validity</p>	<p>B</p>

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16. Duygulu, 2011	Before-after study, repeated measures n=30	nurses, health sector, Turkey	Positive overall effect on leadership practices.	not reported	Effect size unclear  Small sample size  Outcome rather unclear	C
17. Edelman, 2017	randomised controlled study n=31	individuals holding a leadership position for at least a year in the public or private sector	<p>1. Emotional regulation training* increases leader use of deep acting</p> <p>2. Emotional regulation training increases leadership effectiveness.</p> <p>3. The effect of emotional regulation training on leadership effectiveness is mediated by deep acting.</p> <p>4. Emotional regulation training increases leader positive affective displays in interactions with their subordinates.</p> <p>5. The effect of emotional regulation training on leadership effectiveness is mediated by positive affective displays.</p> <p>* Concerned a three-hour training aimed to develop deep acting skills (included practice in participants' own organisation).</p>	effect sizes unclear	effect size unclear	A
18. Eden, 2000	Meta-analysis of RCTs k=7	various	Small to moderate overall effect.	not reported	no serious limitations	A

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<p>19. Frich, 2015</p>	<p>systematic review of longitudinal and controlled studies k=45</p>	<p>physicians</p>	<p>1. The studies showed considerable heterogeneity concerning conceptual frameworks, teaching and learning methods, educational content, evaluation design, and outcomes measured.</p> <p>2. All 45 studies reported positive outcomes, but few studies reported system-level (4) effects, such as improved performance on quality indicators for disease management or increased customer satisfaction.</p> <p>3. Our findings suggest that the leadership programmes described in the medical literature focus more on the ‘know’ and ‘do’ elements of leadership than the ‘be’ component, which some argue is fundamental in attaining the capacity to lead.</p> <p>4. It was found that the literature on physician leadership development has been centred on imparting conceptual knowledge to physicians as individuals, for which lectures and seminars may be suitable, and has directed fewer resources to efforts in building self-awareness, for which action-based learning, feedback and self-development activities may be more appropriate.</p> <p>5. Importantly, the few studies that documented favourable organisational outcomes, such as improvement in quality indicators for disease management, were characterised by the use of multiple learning methods, including lectures, seminars and group work, and involved action learning projects in multidisciplinary teams. The implication of this finding is that greater investment in programmes using teamwork and multiple learning methods is likely to have the largest impact around leadership development for physicians.</p>	<p>Not reported</p>	<p>Limited search</p> <p>Most studies included evaluated the effect on KP level 1 or 2 (only 6 out of 45 reported on level 3 or 4)</p>	<p>B</p>
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<p>20. Kiesewetter, 2013</p>	<p>systematic review k=8</p>	<p>healthcare, physicians</p>	<p>1. The small number of studies included in the review shows that the systematic and evidence-based development of leadership skills does not currently play a prominent role in the training of physicians.</p> <p>2. The range of training programmes is very broad and leadership skill components are diverse.</p> <p>3. The diverse concepts underlying leadership skills in medical training show little agreement as to what content should be emphasised in the development of leadership skills.</p> <p>4. Reactions of participants to trainings were positive (KP level 1), yet no behavioural changes (KP level 3 and 4) through training were examined.</p>	<p>not reported</p>	<p>Limited nr of studies included</p> <p>Design and quality of the studies unclear</p>	<p>C</p>
<p>21. Krejci, 1997</p>	<p>Before-after study n=87</p>	<p>nurses, health care, USA</p>	<p>Significant difference in the perception of the understanding and the ability of the leadership competencies.</p>	<p>No effect sizes reported</p>	<p>Self-report</p> <p>Possible halo effect</p>	<p>C</p>
<p>22. Lacerenza, 2017</p>	<p>Meta-analysis k=335 Repeated measure design, independent groups design, independent groups design with repeated measures</p>	<p>various</p>	<p>1. Leadership training programmes have a positive effect.</p> <p>2. Leadership training programmes have a positive effect on trainee reactions.</p> <p>3. Leadership training programmes have a positive effect on affective-, cognitive- and skill-based learning outcomes.</p> <p>4. Leadership training programmes lead to the transfer of trained affective-, cognitive- and skill-based concepts.</p> <p>5. Leadership training programmes positively influence organisational and subordinate outcomes.</p> <p>The strength of these effects differs based on various design, delivery and implementation characteristics. Moderator analyses support the use of needs analysis, feedback, multiple delivery methods (especially practice), spaced training sessions, a location that is on-site, and face-to-face delivery that is not self-administered. Results also suggest that the content</p>	<p>1) <math>\delta=.76</math> CI95 .64 .89 2) <math>\delta=.63</math> CI95 .12 1.15 3) <math>\delta=.73</math> CI95 .62 .85 4) <math>\delta=.82</math> CI95 .58 1.06 5) <math>\delta=.72</math> CI95 .60 .84 6) See tables 1-7</p>	<p>Many hypotheses and moderators tested</p> <p>Studies from 1951 included</p> <p>Quality of the included studies unclear</p>	<p>B</p>

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			of training, attendance policy and duration influence the effectiveness of the training programme.			
23. Leskiw, 2007	Systematic review k=?	Best practice organisations	Six key factors were found to be vital for effective leadership development: a thorough needs assessment, the selection of a suitable audience, the design of an appropriate infrastructure to support the initiative, the design and implementation of an entire learning system, an evaluation system, and corresponding actions to reward success and improve on deficiencies.	Not reported	Very limited search  Number, design and quality of included studies unclear	D
24. Leslie, 2005	Before-after study n=56	paediatricians, health care, USA	Participants were confident in many of their leadership qualities but desired increased training, particularly in areas of time and priority management and leading 'from the middle'.  Participants positively evaluated the training programme and improved in self-reported basic competencies; 87% also reported fully or partially achieving a leadership-related goal.	not reported	Self-report Small sample	C

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<p>25. Lista, 2022</p>	<p>longitudinal study (18 months) n=24</p>	<p>members from the administrative sector of a public higher education institution and a public teaching hospital</p>	<ol style="list-style-type: none"> <li>1. The adoption of traditional teaching methods impacts the development of LM hard skills.</li> <li>2. The adoption of traditional teaching methods does NOT impact the development of LM soft skills.</li> <li>3. The adoption of active learning methods positively impacts the development of LM hard skills.</li> <li>4. The adoption of active learning methods positively impacts the development of LM soft skills.</li> <li>5. Results indicated that soft skills development is mainly facilitated by active teaching methods.</li> </ol> <p>Conclusion: Traditional teaching methods can be a good choice for learning hard skills. However, it is recommended to include active learning methods to assist in the comprehension of more complex and abstract LM concepts (soft skills).</p>	<p>not reported</p>	<p>Small sample</p>	<p>C</p>
<p>26. Lyons, 2018</p>	<p>systematic review k=11 including RCTs</p>	<p>medical students</p>	<ol style="list-style-type: none"> <li>1. Leadership curricula evaluated were markedly heterogeneous in their duration and composition.</li> <li>2. The lack of a widely accepted definition of clinical leadership and what it entails further complicates training, assessment and comparison of approaches.</li> <li>3. A wide range of leadership curricula have shown subjective effectiveness. There is limited objective evidence, however, and few studies have measured effectiveness at the system and patient levels (KP 4).</li> <li>4. Effective programmes tended to utilise a combination of didactic learning, tutorials and reflective learning.</li> </ol>	<p>not reported</p>	<p>no serious limitations</p>	<p>A</p>

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			5. Because all durations of intervention showed positive results, long and complex courses may not be required to achieve positive change; short, punchy courses with clear objectives may well be as effective.			
27. Malling, 2009	Controlled before-after study  n=56	consultants responsible for postgraduate medical education, health sector	1. No differences in multi-source feedback scores at one year follow-up compared with baseline measurements, either in the intervention or in the control group. 2. Leadership course following an MSF procedure compared with MSF alone does not improve leadership skills.	0 / ns	Prone to selection bias  High dropout in control group	B
28. Mesmer, 2010	Meta-analysis  k=159	Adults	Meta-analysis on impact of pre-training interventions on learning. 1. Trainees provided with attentional advice prior to training will have higher average learning scores on measures of cognitive (H1a) and skill-based (H1b) learning than trainees not provided with such advice. 2. Trainees provided with general attentional advice prior to training did NOT have higher average learning scores on measures of cognitive (H2a) but did on skill-based (H2b) learning than trainees provided with specific attentional advice. 3. Trainees provided with meta-cognitive strategies prior to training have higher average learning scores on measures of cognitive (H3a), skill-based (H3b), and partially on affective (H3c) learning than trainees not provided with meta-cognitive strategies. 4. Trainees provided with 'why-based' meta-cognitive strategies may perform better on cognitive measures of learning than trainees	1) a $\delta=.67$ b $\delta=.80$ 2) a $\delta=.71$ vs $.66$ b $\delta=.88$ vs $.65$ 3) a $\delta=.61$ b $\delta=.51$ c $\delta=.40$ 4) Cognitive average Think $\delta=.62$ (ns) Why $\delta=.60$	Design and quality of included studies unclear	B

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			<p>provided with ‘think aloud’ strategies, but NOT on skill-based learning.</p> <p>5. Trainees provided with advance organisers performed better on indicators of cognitive (H5a) and skill-based (H5b) learning than trainees not provided with advance organisers. Stronger results were found for graphic rather than textual organisers for skill-based learning outcomes.</p> <p>6. Trainees provided with a pre-training goal orientation (whether mastery- or performance-oriented) performed better on indicators of cognitive (H6a), skill-based (H6b), and affective (H6c) learning than trainees not provided with a pre-training goal.</p> <p>7. Trainees provided with a mastery goal orientation will perform better on indicators of cognitive (H7a), skill-based (H7b), and affective (H7c) learning than trainees provided with a performance goal orientation.</p> <p>8. Trainees provided with preparatory information will perform better on indicators of cognitive (H8a), skill-based (H8b), and affective (H8c) learning than trainees not provided with preparatory information.</p>	<p>Skills average Think <math>\delta=.57</math> Why <math>\delta=.40</math></p> <p>5) a <math>\delta=.54</math> b <math>\delta=.71</math></p> <p>6) a <math>\delta=.71</math> b <math>\delta=.71</math> c <math>\delta=.85</math></p> <p>7) a not tested b <math>\delta=.89</math> vs <math>\delta=.60</math> c <math>\delta=.47</math> (direct comparison)</p> <p>8) n not tested b <math>\delta=.48</math> c <math>\delta=.45</math></p> <p>See tables 2-7 for more detailed effect sizes</p>		
29. Morrow, 1997	Meta-analysis of controlled and uncontrolled studies  k=18	various managerial levels, pharmaceutical sector, USA	Large variation of effectiveness of the programmes.	<p>1. Range of d-.09 to 1.11</p> <p>Managerial training d.31, utility (ROI) 45%, with less than d.64 and ROI 418% for sales/technical training</p>	Rater bias  Small sample sizes	B

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30. Mianda, 2018	systematic review of pre-post and cross-sectional studies k=24	frontline healthcare providers	<p>1. Clinical leadership development is an ongoing process and must target both novice and veteran frontline health care providers.</p> <p>2. The content of clinical leadership development interventions must encompass a holistic conceptualisation of clinical leadership.</p> <p>3. Interventions for clinical leadership development should use work-based learning approaches, and experiential and practice-based learning, as these are reported as the most effective.</p>	not reported	merely descriptive & anecdotal review	B
31. Middleton, 2019	longitudinal study with repeated measures n=39	leaders working in museums in a wide range of countries	<p>1. At the within-person level of analysis, leaders engaged in a formal leader development programme* experience positive growth in leader identity over the duration of the programme**.</p> <p>2. However, leader identity growth trajectories vary across participants.</p> <p>3. (a) Within-person, state-like learning goal orientation is positively related to leader identity over time and (b) between-person, trait-like learning goal orientation is positively related to leader identity over time.</p> <p>*Concerned a five-month programme.</p> <p>**Note: it was found that on average, the positive growth rates slow down over time.</p>	<p>1. <math>B=.05</math>; <math>R^2=.09</math></p> <p>3a. <math>B=.06</math></p> <p>3b. <math>B=.26</math></p>		C
32. Powell, 2010	Meta-analysis of various designs k=85 n=4.779	entry-level and middle management	<p>1. The overall effect of managerial training interventions is small.</p> <p>2. The effects did not improve over time (50 years).</p>	<p>1. <math>r=.25</math></p> <p>2. Between .18 and .38</p>	Limited information on the measures or characteristics of the interventions.	A/B

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			3. When the outcome being sought, or at least tested for, is a learning outcome, the effect size magnitudes are consistently larger than the other outcome groups and these effects are more consistently significant.	3. Between .17 and .55		
33. Reichard, 2017	Cross-sectional and (quasi) longitudinal study n=73, 94 and 49	organisational leaders from non-profit agencies in the Midwestern United States	1. Leader developmental efficacy* (LDE) is positively related with intentions to engage in leader self-development activities.  2. Intentions to engage in leader self-development activities positively mediate the relationship between LDE and implementation of leader self-development activities.  3. LDE is not positively related to increases in leader efficacy during leader development.  * LDE=one's belief in his/her ability to develop leadership knowledge or skills.	1. r=.33 / .46 β=.30  3. ns /mixed	no serious limitations	C
34. Reyes, 2019	Meta-analysis (k=73, n=5654)	students in higher education, including exec programmes	1. Leadership development programmes have a positive effect on trainee learning outcomes (H1a) and transfer (H1b).  2. Voluntary leadership development programmes enhance trainee learning (H2a) outcomes to a greater degree than involuntary programmes.  3. Leadership development programmes spanning multiple training sessions do NOT result in greater effects on learning (H3a) and transfer (H3b) outcomes compared with training programmes with one massed training session  4. Leadership development programmes incorporating only a practice-based method do NOT lead to greater effects on trainee learning (H4a) and	1a: d=0.50 1b: d=0.36  2: d=.60 vs .23  3: ns or 0  4: ns or 0 (!)  5: ns or 0 (!)	Design and quality of included studies not reported  CIs for some ES rather wide  !: non-significant findings of 4-6 due to too	C

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			<p>transfer (H4b) outcomes compared with programmes incorporating only information- or demonstration-based methods.</p> <p>5. Leadership development programmes reporting the use of feedback do NOT display a greater effect on trainee learning (H6a) and transfer (H6b) outcomes compared with programmes that do not report the use of feedback.</p> <p>6. Face-to-face leadership development programmes with live facilitators do NOT increase positive trainee learning (H7a) and transfer (H7b) outcomes to a greater degree than online, self-administered programmes.</p>	6: ns or 0 (!)	small sample size	
35. Seeg, 2022	longitudinal study (10 months) n=62	leaders of a German middle-sized organisation - most held a middle management position.	<p>1. Training with an evidence-based transfer design* not only has (a) positive short-term effects in terms of reactions and learning but also have (b) strong positive long-term effects regarding transfer behaviour (near and far transfer) and results (improved leadership).</p> <p>2. Near and far transfer is directly predicted by only three transfer determinants (even considering baseline effects): (a) learning, (b) transfer motivation, and (c) transfer opportunity, and learning has the strongest impact on transfer success.</p> <p>3. An evidence-based transfer training design substantially explains the primary transfer determinants (even considering baseline effects): (a) learning, (b) transfer motivation, and (c) transfer opportunity.</p> <p>*See Salas, 2012, checklist table and principles of Behaviour Modelling Training.</p> <p>See practical implications.</p>	<p>1a: transfer motivation r=.34 learning r=.47</p> <p>1b: near transfer r=.55 far transfer r=.34 lead comm r=.79* .67** lead beh=.79* .74**</p> <p>2 (see note!). near transfer: learning: <math>\beta</math>=.60 motivation: <math>\beta</math>=.34 opportunity: <math>\beta</math>=.40</p>	no serious limitations	B



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				<p>far transfer:  near transfer:  learning: <math>\beta=.49</math>  motivation: <math>\beta=.24</math>  opportunity: <math>\beta=.39</math></p> <p>3.  a. learning: <math>\beta=.34</math>  b. motivation: <math>\beta=.33</math>  c. opportunity: <math>\beta=.49</math></p> <p>* self-rating  ** follower rating</p> <p>note: multiple regression showed only learning was significantly and positively associated with near transfer (<math>\beta=0.52</math>) and far transfer (<math>\beta=0.42</math>)</p>		
36. Solansky, 2010	Cross-sectional survey with post-test n=303	administrators and leadership mentors, education, USA	<p>1. Note: Differences between self-report and observer report.</p> <p>2. Coaching time (a) and number of contacts (b) are both significantly, positively and moderately related to mentees' willingness to share information with mentors and the mentee group regarding their leadership.</p>	<p>2a. <math>\beta .18</math>  2b. <math>\beta .02</math></p>	Observers were chosen by the participants	C

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37. Steinert, 2012	systematic review (mostly pre-post) k=41	clinical faculty members (US and Canada)	<p>1. Participants value leadership development activities and report changes in attitudes, knowledge, skills and behaviour.</p> <p>2. Despite methodological limitations, certain programme characteristics seem to be associated with positive outcomes: (1) the use of multiple instructional methods; (2) experiential learning and reflective practice; (3) individual and group projects; (4) peer support; (5) mentorship; and (6) institutional support.</p>	not reported	no serious limitations	B
38. Storey, 2004	Review of cross-sectional studies k=?	various sectors, SME's, various countries	Mixed evidence for the effect of formal training.	not reported	sample unclear	C
39. Taylor, 2005	Meta-analysis of randomised and non-randomised studies k=117	various sectors, employees and countries	<p>1. Effects were largest for learning outcomes, smaller for job behaviour and results outcomes.</p> <p>2. Although effects on declarative knowledge decayed over time, training effects on skills and job behaviour remained stable or even increased.</p> <p>3. Skill development was greatest when learning points were used and presented as rule codes and when training time was longest.</p> <p>4. Transfer was greatest when:  a) mixed (negative and positive) models were presented  b) practice included trainee-generated scenarios  c) trainees were instructed to set goals  d) when trainees' superiors were also trained  e) when rewards and sanctions were instituted in trainees' work environments.</p>	<p>1. declarative knowledge d=1.20;  procedural knowledge d=1.18;  attitudes d=.33;  job behaviour d=.27;  workgroup productivity d=.13;  workgroup climate d=.11</p>	Contains 0 in some of the confidence intervals	A
40. Taylor, 2009	Meta-analysis of randomised and non-	Various samples, managers,	1. Managerial training is positively related to transfer of learning for all rating sources.	1) Self $\delta$ =.64 Superior $\delta$ =.53	Sometimes conclusions	B

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	randomised studies k=107	various countries	<ol style="list-style-type: none"> <li>2. Population effect size estimates for studies without control groups were larger than studies with control groups when based on (a) superior and (b) peer ratings, but smaller when based on (c) self- and (d) subordinate ratings.</li> <li>3. For self-ratings sources, superior ratings and subordinate ratings the standardised betas were relatively small, positive, and non-significant with regard to time lag between training and post-test.</li> <li>4. Transfer effect sizes for interpersonal skills management training programmes, followed a similar pattern across the four rating sources as when all studies were compared.</li> <li>5. The topic with the greatest training transfer perceived by subordinates was for (a) general management skills training compared with (b) interpersonal skills and (c) goal-setting or performance appraisal skills.</li> </ol>	<p>Peer <math>\delta=.26</math> Subordinate <math>\delta=.13</math></p> <p>2) a <math>\delta=.55</math> vs <math>.45</math> b <math>\delta=.35</math> vs <math>.21</math> c <math>\delta=.60</math> vs <math>.90</math> d <math>\delta=.10</math> vs <math>.18</math></p> <p>4) Table 5</p> <p>5) a <math>\delta=.50</math> b <math>\delta=.11</math> c <math>\delta=.34</math></p> <p>More effect sizes in tables 2-6</p>	are drawn on a rather small amount of studies (and small total n)	
41. Van der Locht, 2013	Cross-sectional n=595	Managers	<ol style="list-style-type: none"> <li>1. The use of identical elements* is positively related to training transfer.</li> <li>2. The relationship between the use of identical elements and training transfer is partially mediated by motivation to transfer.</li> <li>3. Motivation to learn is positively related to training transfer.</li> <li>4. The relationship between motivation to learn and training transfer is mediated by motivation to transfer.</li> <li>5. Expected utility is positively related to training transfer.</li> <li>6. The relationship between expected utility and training transfer is partially mediated by motivation to transfer.</li> <li>7. Identical elements will predict training transfer over and above trainees' motivation to learn and expected utility.</li> </ol> <p>* Identical elements refer to the extent to which the stimuli and responses in the training setting are identical to those in the actual performance environment.</p>	<p>1) <math>r=0.53</math></p> <p>3) <math>r=0.42</math></p> <p>5) <math>r=0.57</math></p>	No serious limitations	D

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42. Webb, 2014	systematic review k=24	medical students	Overall, evaluation of effectiveness and quality of evidence showed that most curricula did not demonstrate changes in student behaviour or quantifiable results.	not reported	design and quality of the included studies unclear	C
43. Yeardeley, 2017	Quasi-longitudinal study (desk research)  n=45 + 20	Courses delivered by private training providers in the UK	<p>Examines the content delivery of courses provided by private training providers (PTPs) for first-level managers (FLMs). It measured, against a contemporary 'best practice' soft skill framework, the relevance of 'off the shelf' training which aimed at FLMs managerial soft skills, as opposed to 'technical' or 'hard skill' training.</p> <p>1. Findings revealed serious omissions and contrary positions when it comes to teaching FLMs non-technical skills. On some PTP courses there appeared contrary positions taken up on key managerial concepts, such as leadership.</p> <p>2. Of the 45 FLM courses researched, there has only been one which covered all the soft skills identified in the framework*.</p> <p>* For an overview of soft skills: see Table I.</p>	N.A.	Best practice soft skill framework based on models that are not aimed at first-level managers	C

### Overview of excluded meta-analyses

1st author and year	Reason for exclusion
1. Abdullah, 2010	Cross-sectional study based on self-report, concerns a small sample > questionable validity of measures.

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2. Amagoh, 2009	Narrative literature review/expert opinion.
3. Avolio, 2010	Study calculates return on leadership development investment (RODI) for training at different organisational levels for on-site, off-site and online training. Effect sizes are taken from an earlier meta-analysis by Avolio (2009).
4. Burke, 1986	Publication date out of scope (1986), often-cited study though. Results of 70 managerial training studies to empirically integrate the findings of the studies. The meta-analysis results for 34 distributions of managerial training effects representing six training content areas, seven training methods, and four types of criteria (subjective learning, objective learning, subjective behaviour, and objective results) indicated that managerial training is, on the average, moderately effective.
5. Day, 2000	Narrative literature review/expert opinion, no effect sizes or any other empirical data reported.
6. Day, 2014	Narrative literature review, focuses only on papers published in <i>The Leadership Quarterly</i> , no effect sizes or any other empirical data reported.
7. Georgiadis, 2016	The intervention (training) was aimed to develop the general skills of non-managerial staff and to increase their productivity.
8. Jeyaraman, 2018	Descriptive scoping review, no effect sizes or any other empirical data reported.
9. Kelloway, 2010	Narrative literature review/expert opinion, no effect sizes or any other empirical data reported.
10. Lopes, 2013	Review into characteristics of the use of business games in leadership development. in SCOPUS, ISI, and BKL (Bernie Keys Library) databases. The review identified five games that met the criteria and objectives of this research. This study shows that using business games for leadership development is still a hard task. It points up some problems and difficulties in this task and suggests ways to develop more effective methods for leadership development with business games.

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11. Markuns, 2010	Expert opinion.
12. Morahan, 1998	Expert opinion.
13. Niemiec, 1992	Publication date out of scope (1992). The meta-analysis synthesised the results of 22 studies of management education in institutional settings. The results indicate that the treatment's median effect size is .7 - a fairly substantial effect. Several differential effects were noticed, including the experience level of the managers and the types of instrumentation and institutional setting.
14. Pearson, 2007	Does not concern leadership training.
15. Salas, 2012	Unsystematic literature review on effectiveness of training. Does provide an overview of previous meta-analysis and checklists for different phases of the training process.
16. Straus, 2013	Not relevant given the REA question: findings suggest that (some) leadership training programmes affected participants' advancement in academic rank and hospital leadership position and that participants were more successful in publishing papers. Other outcomes were based on too limited number of studies.
17. Stoller, 2013	Expert opinion
18. Tafvelin, 2019	Concerns specific type of leadership training ('need-supportive leadership training'), results are non-significant.
19. Yeung, 2012	Outcome measure (association between team leadership skills and cardiac arrest simulation test score, pre-shock pause, and hands-off ratio) not relevant.

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