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Team Training and Performance

Svend Erik Thomsen, Ph.d.
set@sdu.dk

University of Southern Denmark
Faculty of Social Science

Background of the Presentation

Social science ph.d. (defence in December 2012)

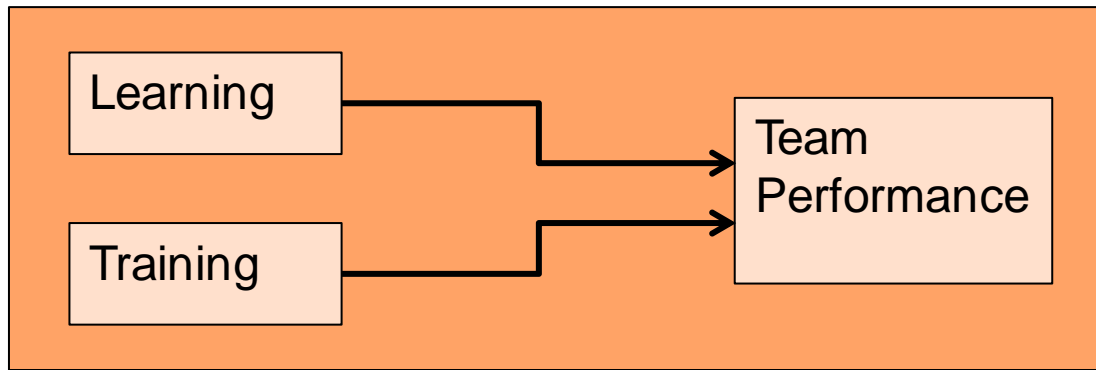
”Multilevel Inquiries of Learning, Training, and Performance of Organizational Teams

- The Case of Fluid Teams at a Medical Trauma Center”



Research Question about Teamwork

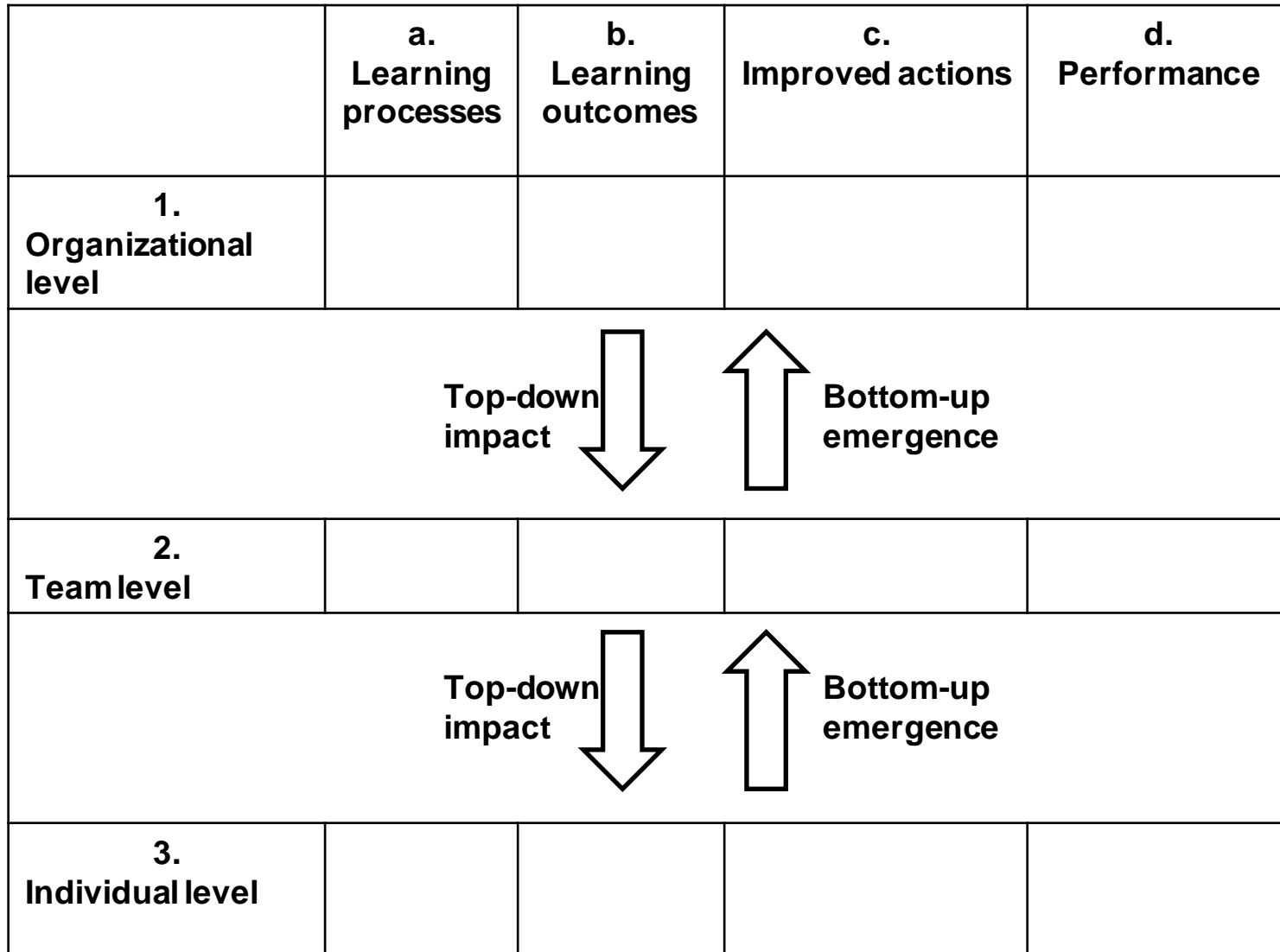
What is the impact of learning and training on performance?



Theoretical background – the field of management and organization:

1. Research literature that focuses on organizational learning.
It is expected that people improve as they acquire more and more everyday work experience.
2. Research literature about training.
It is expected that people improve if they participate in job-relevant training interventions.

Multilevel Framework



The Litterature on Team Learning and Team Training

Team Learning Research in Science Categories Web of Science®, March 2012

Science category	Number of published items
Education, educational research	276
Education, scientific disciplines	193
Management	144
Business ²	65
Psychology, applied	45
Psychology, educational	41
Psychology, multidisciplinary	35
Psychology, social	28
Psychology	12
Education, special	5
Total	809

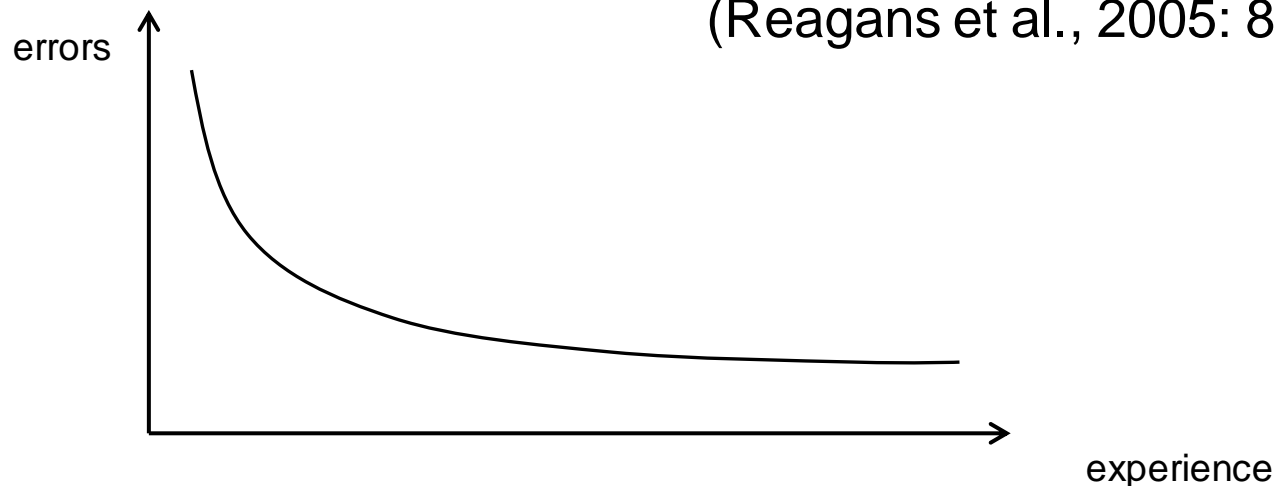
Training Research in Science Categories Web of Science®, March 2012

Science category	Number of published items
Health care sciences services	73
Surgery	54
Psychology applied	45
Ergonomics	33
Obstetrics gynecology	31
Sport sciences	30
Critical care medicine	28
Emergency medicine	28
Pediatrics	27
Gerontology	26
Nursing	25
Health policy services	24
Management	24
Education scientific disciplines	23
Total	471

The Relation Between Experience and Performance

*“A long tradition of research in psychology examines the effect of **individual** experience on task performance (Thorndike 1898, Newell and Rosenbloom 1981, Delany et al. 1998). The results of these studies indicate the time individuals take to complete a task, and the number of errors they make decreases at a decreasing rate as individuals gain experience with the task.”*

(Reagans et al., 2005: 871)



The 'Big-five Propositions' in the Team Learning Literature

SUPPORTED : *Team learning behavior has a positive impact on team performance.*

SUPPORTED : *Team leader behavior impacts team learning.*

SUPPORTED : *Team stability impacts team learning.*

SUPPORTED : *Team psychological safety impacts team learning.*

NOT SUPPORTED : *Team learning follows a non-linear learning curve.*

The 'Big-three Propositions' in the Team Training Literature

SUPPORTED

But we lack research about the mechanisms whereby team training impacts performance (Salas et al. 2007)

PARTLY SUPPORTED : *Team training impacts individuals' team work knowledge.*

SUPPORTED : *Team training impacts teams' transactive memory systems.*

Knowledge and Skills of Team Members

It is suggested in the literature that individuals need two types of knowledge and skills for working in teams:

1. Task knowledge and skills, i.e. knowledge and skills that each team member needs for doing his part of the team task.
2. Team work knowledge and skills, i.e. general cognitive knowledge and skills that enables them to work in teams.

“Interdependence, cooperation, communication, and so on are essential elements of teamwork regardless of the team task or contest.”

(Rentsch et al., 1994, p. 452).

Individuals May Develop Team Work Knowledge and Skills in Addition to Task work Knowledge and Skills

Or it can feel easy to get in perfect sync with the team



Methods – The Empirical Part

The empirical study was conducted at one of the big trauma centers in Denmark, The Trauma Center at Odense University Hospital.



Qualitative data:

Interviews with team trauma team members, observations in the trauma room, observations during team training sessions, and during an ATLS training course).

Quantitative data:

Five-year dataset from the hospital (N = 2491 trauma teams):

- a. Individual team members' "trauma team work experience"
- b. Individual team members' "team training participation"
- c. Collective performance of the teams

Individuals' Learning of Two Distinct Types of Knowledge and Skills

Acquisition of knowledge and skills	Taskwork knowledge and skills	Teamwork knowledge and skills
When	Before admission to trauma teams	After admission to trauma teams
Where	Home department	Trauma center
How	<p>many learning opportunities throughout the staff's medical education and worklife</p>	<p>remarkably few learning opportunities here.</p> <p>But a great learning potential.</p>

The Quantitative Part – How I did it ...

The Measure of Work Experience in the Fluid Trauma Teams

Data of 2.491 unique trauma teams was considered (a full 5-year period).



For each and every team the individuals behind the roles were traced.

E.g. the individual in the workrole as teamleader was = Person_Id:73, and the individual in the workrole as nurse 1 = Person_Id: 144

Each individuals' trauma team experience was counted and mapped to the current team.

E.g. on team_id: 132 the individual in the role as teamleader has been teamleader 23 times before this. He is now teamleader for the 24th time.

The Measure of Team Training

For each of the 2.491 teams I checked for individuals' participation in the trauma center's internal team training intervention (a 1-day training session on simulated cases with feedback based on video-recordings).

- Has Teamleader Person_Id 73 done the team training course? YES/NO
- Has Nurse 1 Person_Id 144 done the team training course? YES/NO
- Has Nurse 2 Person_Id 58 done the team training course? YES/NO

The Measure of Team Performance

The calculation of the probability of patient survival contained in the hospital's trauma database follows from the equation below.

$$P_s = \frac{1}{(1+e^{-b})} \quad \text{where } b = b_0 + b_1(TS) + b_2(ISS) + b_3(A)$$

The calculated measure of team performance is given by the equation below:


$$Tp_i = (Ps_i \times Po_i) + Po_i$$

Tp_i = Team performance for a given patient_{*i*}

Ps_i = Probability of survival for the patient_{*i*}

Po_i = Patient outcome for patient_{*i*} (survival coded 1, death coded 2)

The Team Performance Variable

Probability of survival	High	Low	High	Low	 High performance
	$4 > T_p > 2$		$2 > T_p > 1$		
Patient outcome	Die	Die	Survive	Survive	

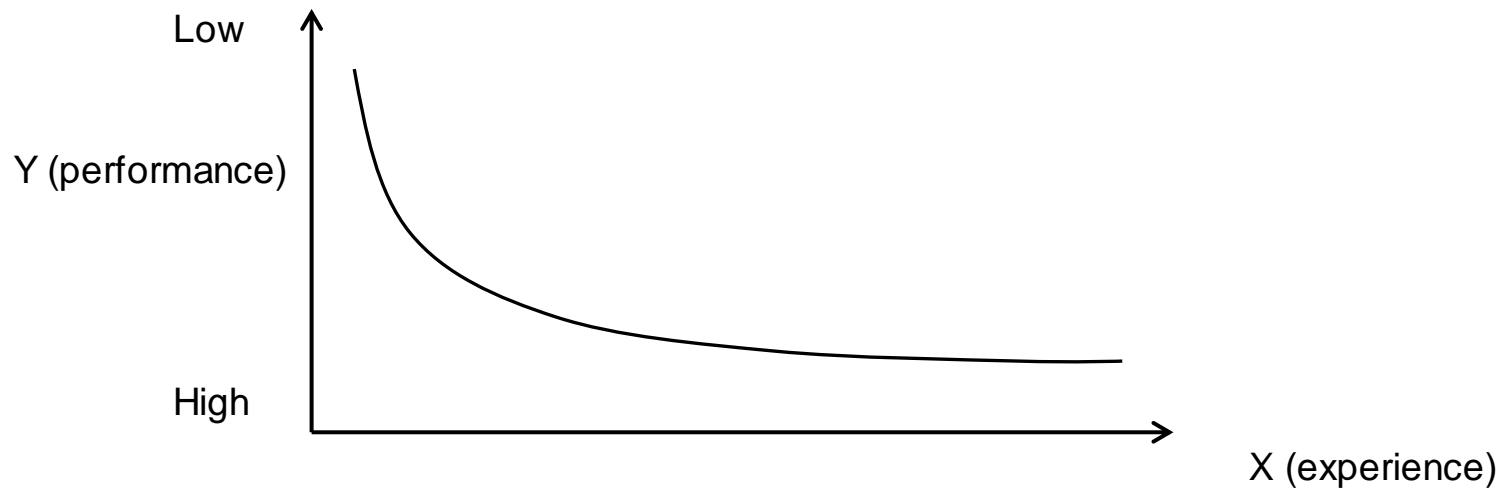
Ps	Outcome	Team Performance
0,99 (high)	2 (die)	$(0,99 \cdot 2) + 2 = 3,98$
0,01 (low)	2 (die)	$(0,01 \cdot 2) + 2 = 2,02$
0,99 (high)	1 (live)	$(0,99 \cdot 1) + 1 = 1,99$
0,01 (low)	1 (live)	$(0,01 \cdot 1) + 1 = 1,01$

Hypothesis: A Standard Learning Curve Relation

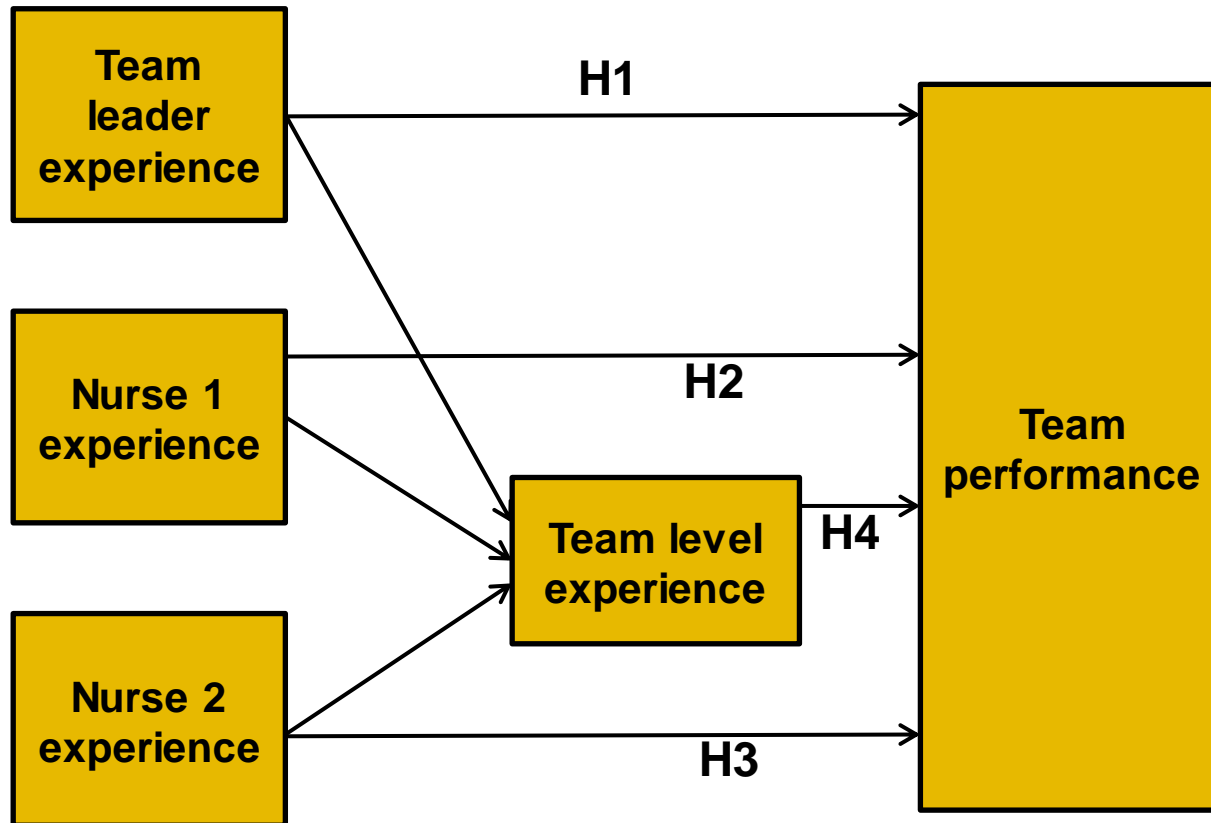
The learning curve relation assumes that performance improves at a decreasing rate as more and more experience is accumulated.

$$Y = C1x^b$$

$$b = \frac{\ln(\text{learning} - \text{rate})}{\ln(2)}$$



Testing the Relation Between Individuals' Experience and Team Performance



Hypotheses: Experience from working on trauma teams has a positive impact on team performance (learning curve relation)

Results – The Impact of Individuals' Experience

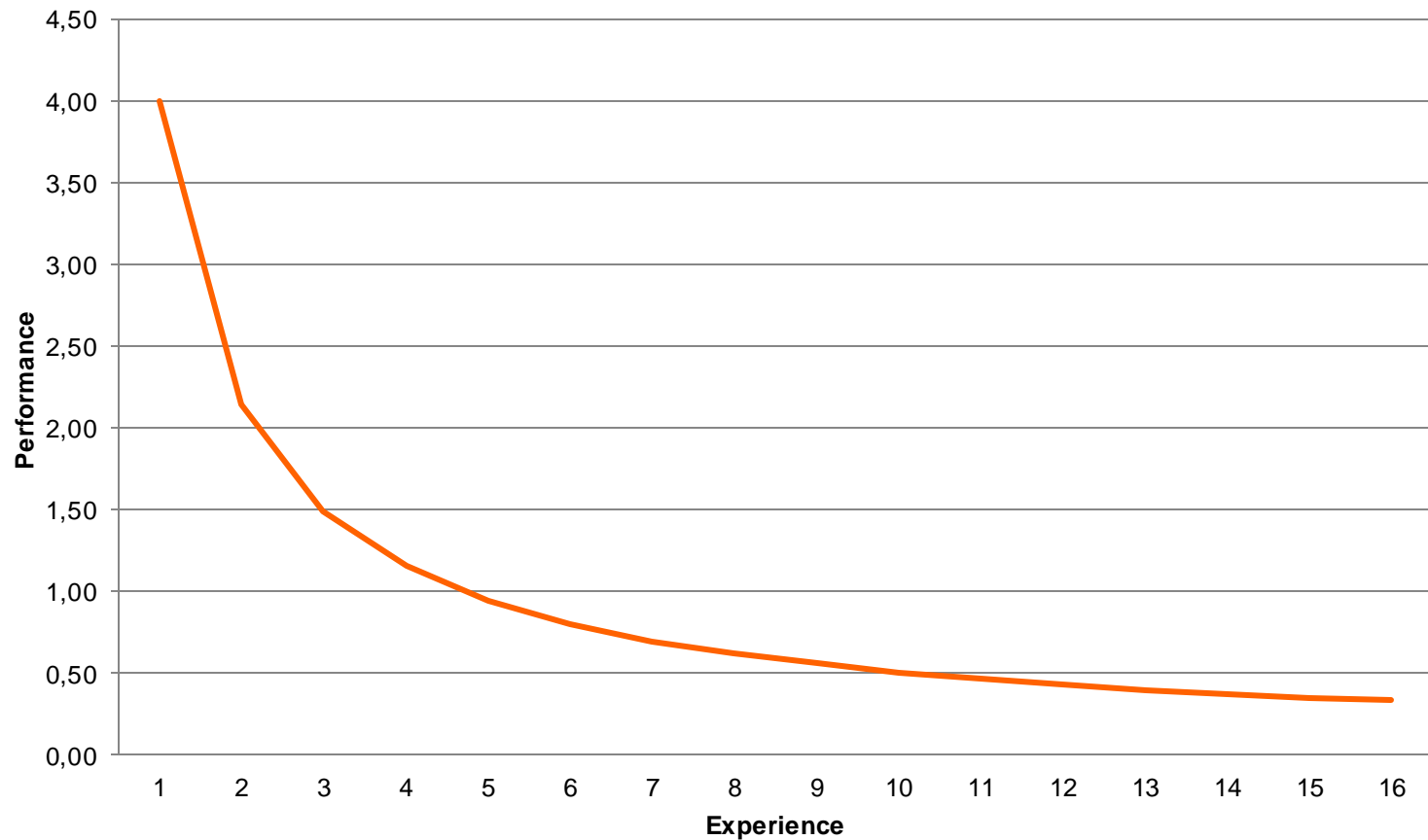
Hypothesis	Independent variable	Best fitted model	Pearson's R	Sig.	Conclusion
1	Team leader exp.	$TP = 1,997 + 0,012 TL \text{ exp.}^{-0,8}$	0,012	0,540	Reject
2	Nurse 1 exp.	$TP = 2,005 - 0,043 \text{ Nurse1 exp.}^{-0,3}$	0,050	0,013	Reject
3	Nurse 2 exp.	$TP = 2,016 + 0,032 \text{ Nurse2 exp.}^{-0,1}$	0,022	0,289	Reject
4	Team exp.	$TP = 1,995 + 0,574 \text{ Team exp.}^{-0,9}$	0,111	0,000	Accept

Aggregate experience has a significant impact on team performance. Whereas each individual's experience has not.

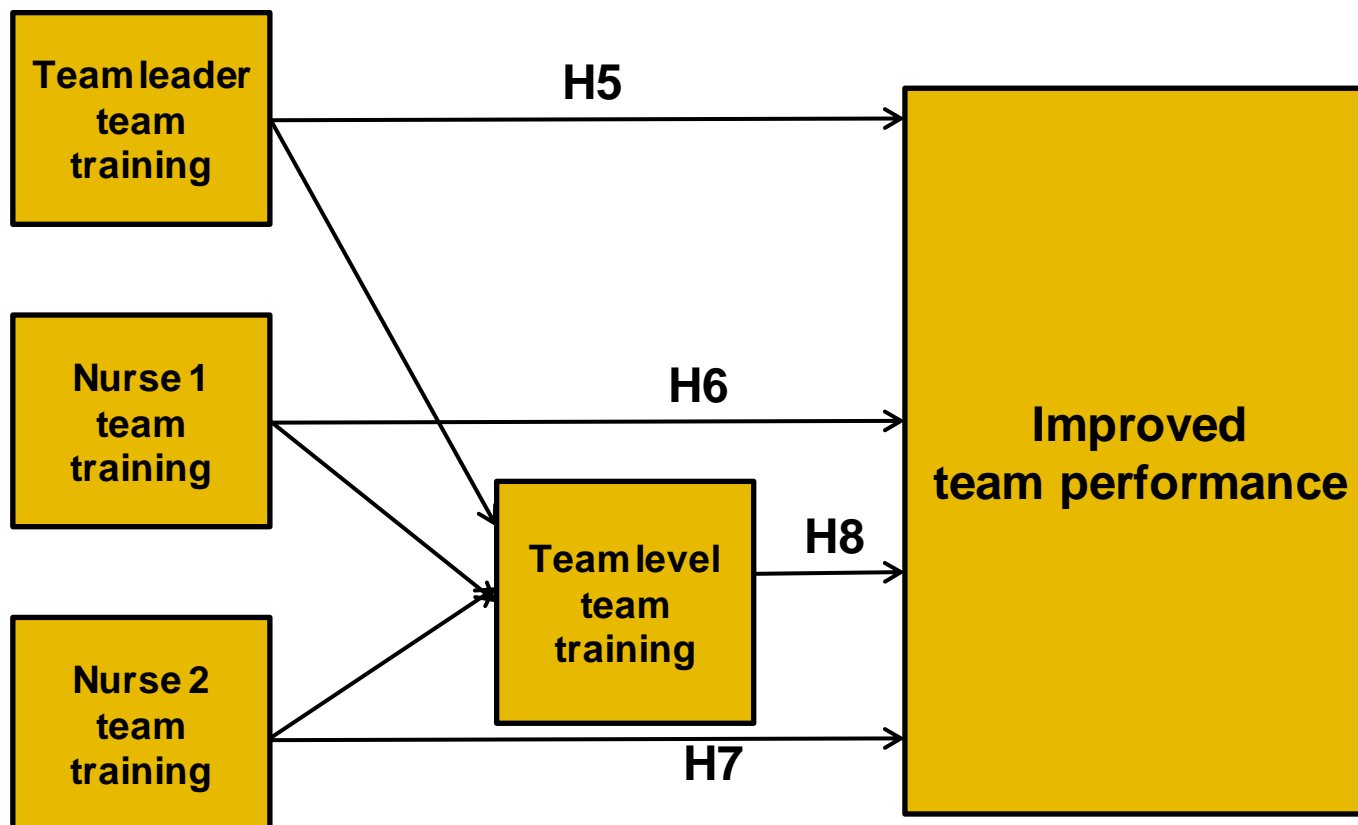
Best fitted model: $b = -0,9$, i.e. performance improves by approx. 44% when experience doubles

The Significant Learning Curve Relation

$$Y = C1x^{-0,9}$$



Testing the Relation Between Individuals' Participation in Team Training and Team Performance



Hypotheses:

Individuals' participation in team training has in addition to individuals' experience a positive impact on team performance.

Results – The Impact of Individuals' Participation in Team Training

Hypothesis	Independent variable	Sig.	Conclusion
5	Team leader team training	0,102	Reject
6	Nurse 1 team training	0,497	Reject
7	Nurse 2 team training	0,349	Reject
8	Team level team training	0,084	Accept

Team level participation in team training has a small but significant ($p < 0,10$) impact on team performance.

In contrast each individual's participation in team training has not a significant impact on team performance.

Theoretical Contributions

- The study confirms that taskwork knowledge and teamwork knowledge are two distinct types of knowledge. Teamwork knowledge seems to have an important impact on performance.
- The individuals' acquisition of teamwork knowledge depends on their experience (learning opportunities) and organizational level initiatives (e.g. trauma manual, feedback from trauma coordinator, management attention, "role models" among staff).
- The learning curve relation between experience and performance can be verified on the aggregate level.
- There is a small but significant positive impact of team members' participation in team training on the aggregate level.

Suggested Practical Implications

Experience matters – especially teams' aggregate experience.

Performance seems to be robust even when newcomers are onboard. As long as teams have experienced team members to compensate for those with meager experience.

Team training matters – especially teams' aggregate participation in team training. This suggests that team training should be offered (or required) broadly for all team members.

Systematic organizational level support for the teams seems to be important for consistent high performance – and maintaining a focus on continuously improvements of performance.

Limitations and Suggestions for Future Research

Only 3 work roles were considered.

Qualitative data suggests that organization level support is important , however, no quantitative data were obtained to cast light on this.

Future work:

Testing if the findings can be verified when full teams are considered.

Testing the impact of organizational level variation (requires data collection in more than one organizational setting).

THANK YOU

**Questions and comments
are most welcome.**

Svend Erik Thomsen, Ph.d.
UNIVERSITY OF SOUTHERN DENMARK
set@sdu.dk