

Setting Work Rates

Project conducted by:

**Centre for Ergonomics & Human Factors,
La Trobe University**

In association with:

AMWU, MTIA, AIG, David Caple & Assoc.

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Commission**

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Many Thanks To:

Participating companies -
their managers and employees
who took part

SEMINAR OVERVIEW

- **WHY THIS PROJECT?** - background
- **WHAT WE DID** - methods used
- **WHAT WE FOUND** - some results
- **OUTCOME** - how can these findings be implemented?

WHY THIS PROJECT?

- **Work takes time** - without enough time, people experience more **fatigue and stress** (impact on quality, health)
- **PMTSs aren't ideal for 'difficult' tasks**
- **Employee participation** in setting work rates.
Job satisfaction
- PMTS methods are NOT widely used, so - **what methods *are* used to set work rates?**

WHAT WE DID

STAGE 1 - 1997 - 1999

- **Recruitment of 20 companies**, mainly manufacturing
- **Choice of 82 'target' tasks** – repetitive, 'externally' paced (line speed, production process itself, targets)
- **Survey** – **37** production managers/ supervisors; **12** OH&S managers/ supervisors; **210** employees (at least 2 per task)

STAGE 2 - 1998 - 1999

- **'In-depth' survey and analyses** of subset of **36** tasks

Stage 1 - Survey

COLLECTED INFORMATION ABOUT:

- **Number of Employees** at the work site
- **Individual Details:** job title, time in job, age, gender, place of birth, languages spoken
- **THE TASKS:** main focus of the survey

Employees Surveyed

- Average age: **39 years**
- Time working for the company: **8.3 years**
- Time in current job: **4.6 years**
- **42% Females and 58% Males**
- **43 languages**
- Birth places: **50 countries**

FINDINGS

- **Task difficulty**
- **Participation and satisfaction**
- **Work rates**
- **What affected stress?**
- **What affected fatigue?**
- **Improving current practice**

TASK DIFFICULTY

Physical Factors Scored:

- **Heavy loads:** lift/push/pull
- **Local loads:** e.g. pinch grip
- **Static & awkward postures**
- **Metabolic demands - HR**

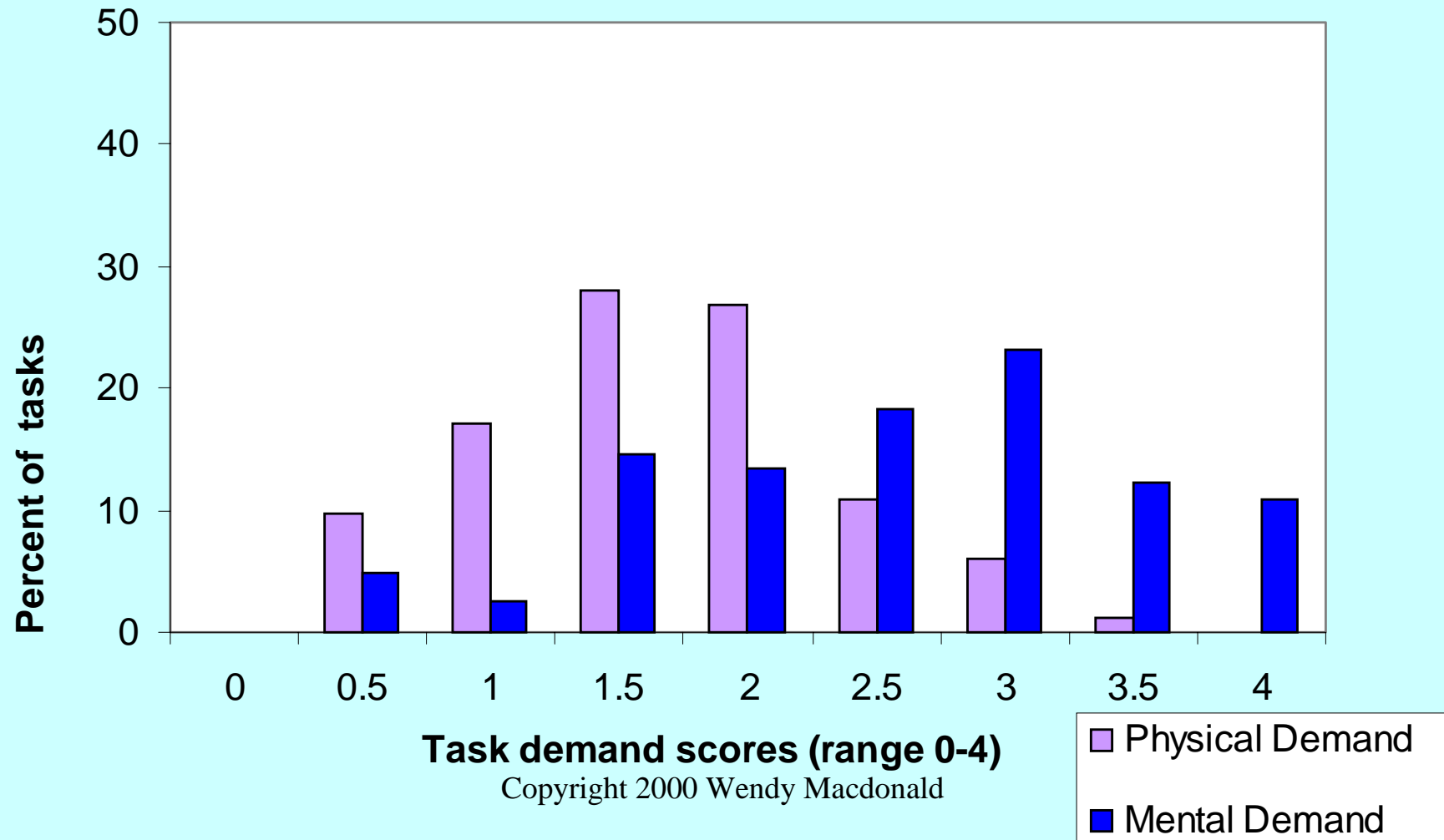
Mental Factors Scored :

- **Perception:** e.g. inspection
- **Motor control:** precision
- **Memory:** STM & LTM
- **Concentration**

Task Difficulty: ... continued

Physical and Mental Task Demand Scores

n=82



Task Difficulty: ... continued

Task Cycle Times

Most tasks were repetitive:

52% - cycle time less than 60 sec

30% - cycle time 1 to 5 min

18% - cycle time 5 to 10 min

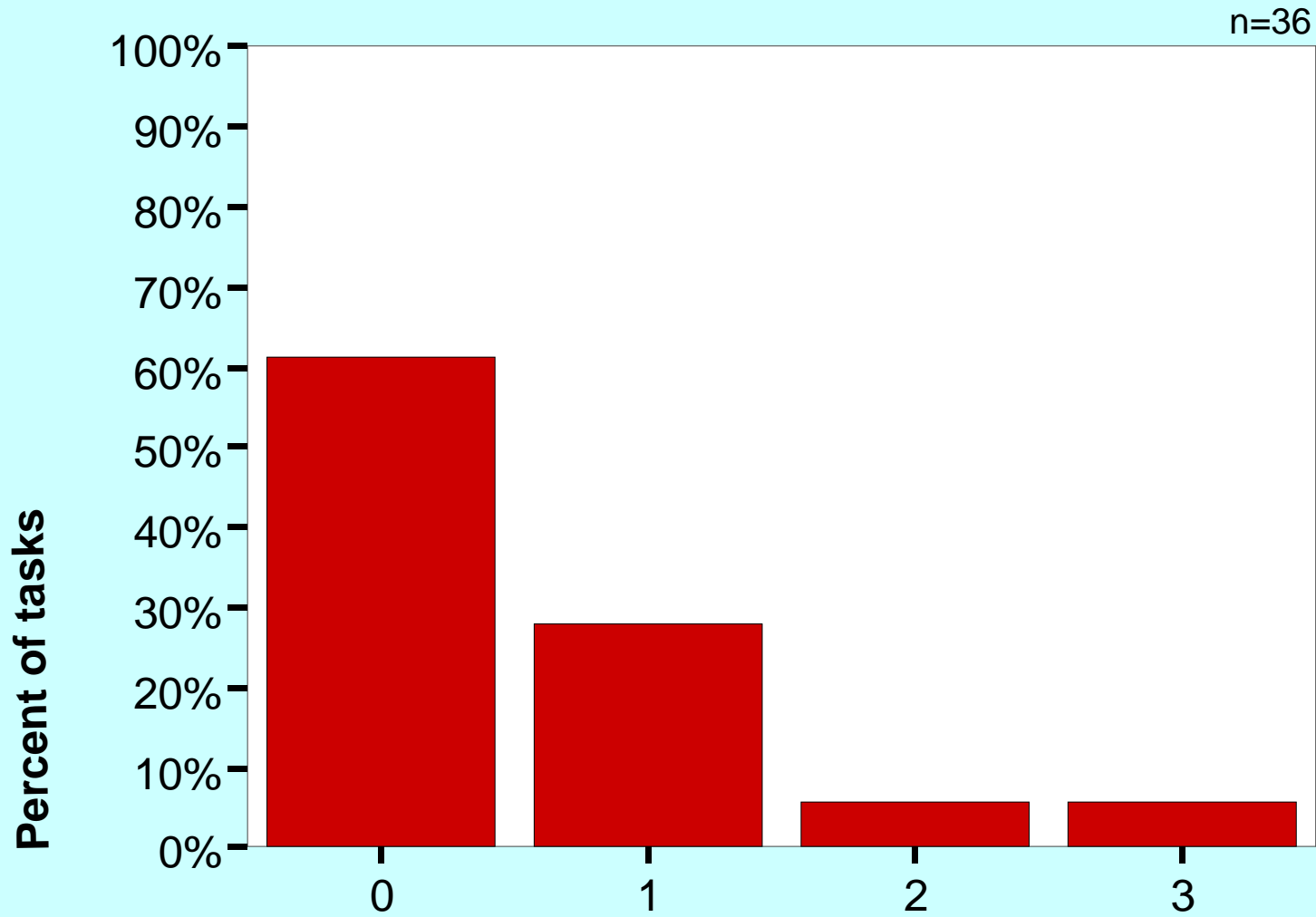
Task Difficulty

Stage 2: In-Depth Analyses

- **forces exerted** (lifting, pushing, pulling)
- **posture** (bending, reaching, twisting, static load)
- **heart rate** (getting ‘puffed out’)
- **mental workload** (range of factors)
- **job motivating potential** (based on factors including variety, autonomy, feedback)
- **job satisfaction**
- **2 ‘stress’ dimensions: ‘stress’ and ‘arousal’**
- **fatigue**

Task Difficulty: ... continued

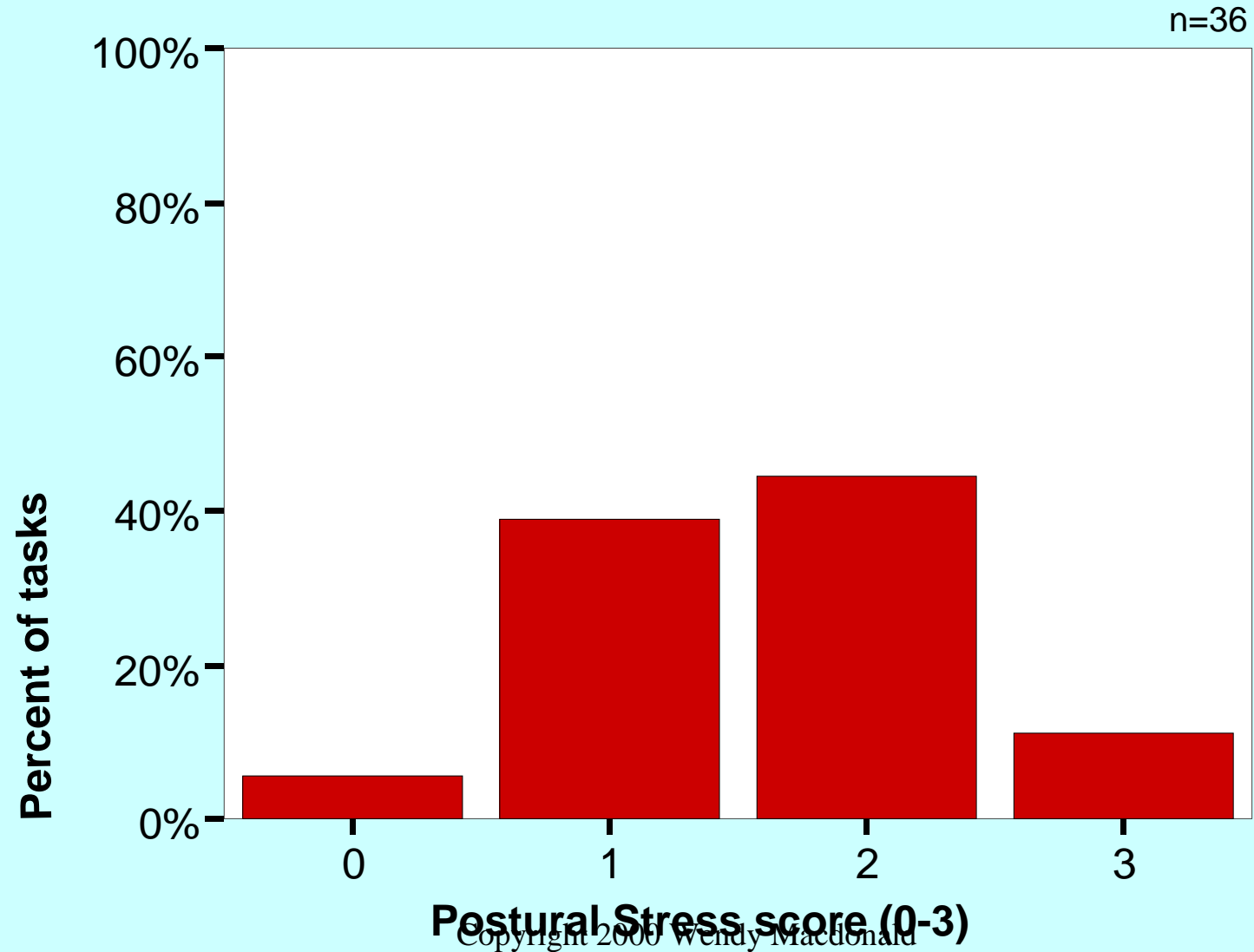
Force Stress score



Force Stress score (0-3)
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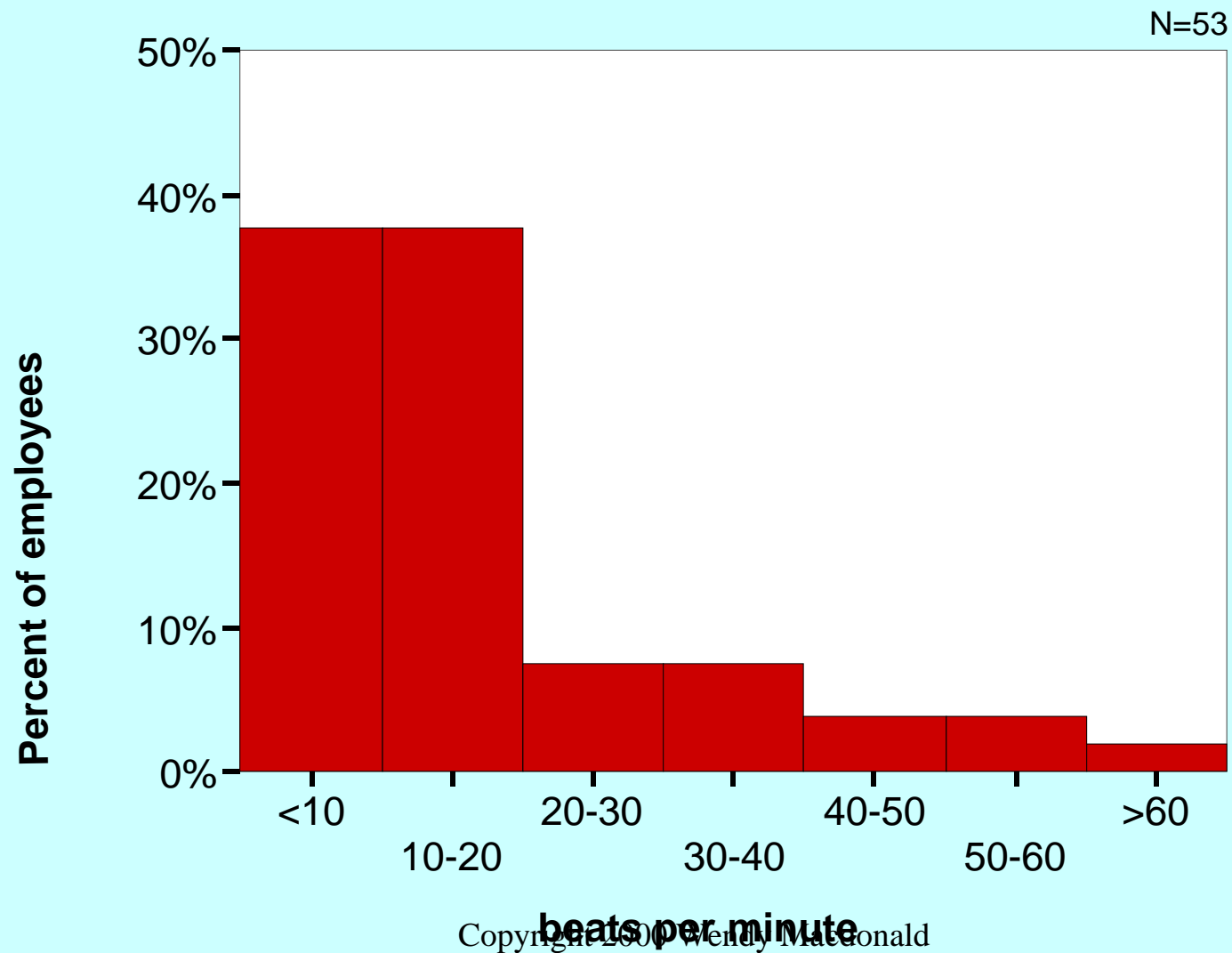
Task Difficulty: ... continued

Postural Stress score

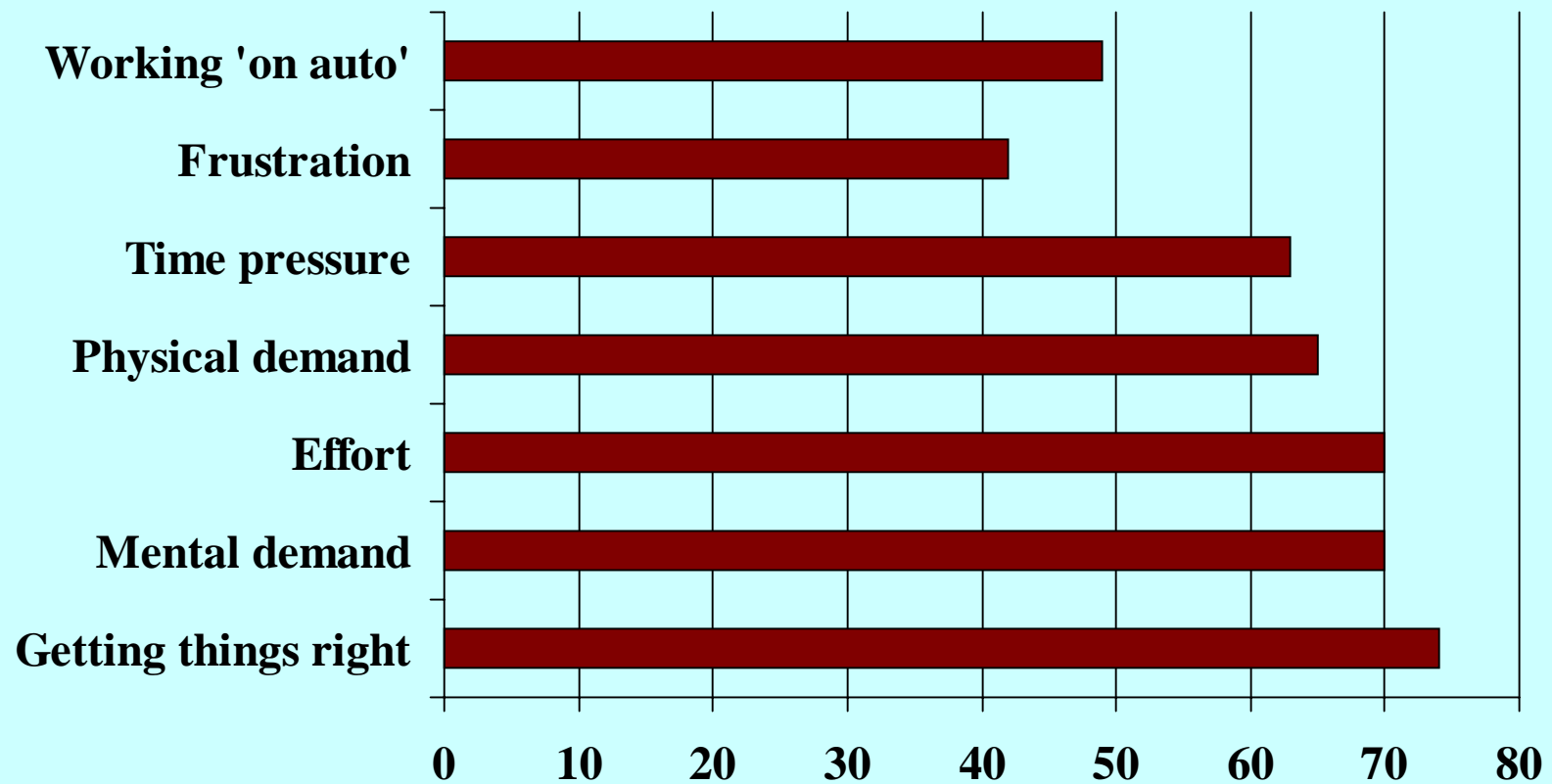


Task Difficulty: ... continued

Heart rate rise



Mental Workload



PARTICIPATION & SATISFACTION

Amount of 'say'

57% felt they had no influence on targets

64% felt they had no influence on line speeds

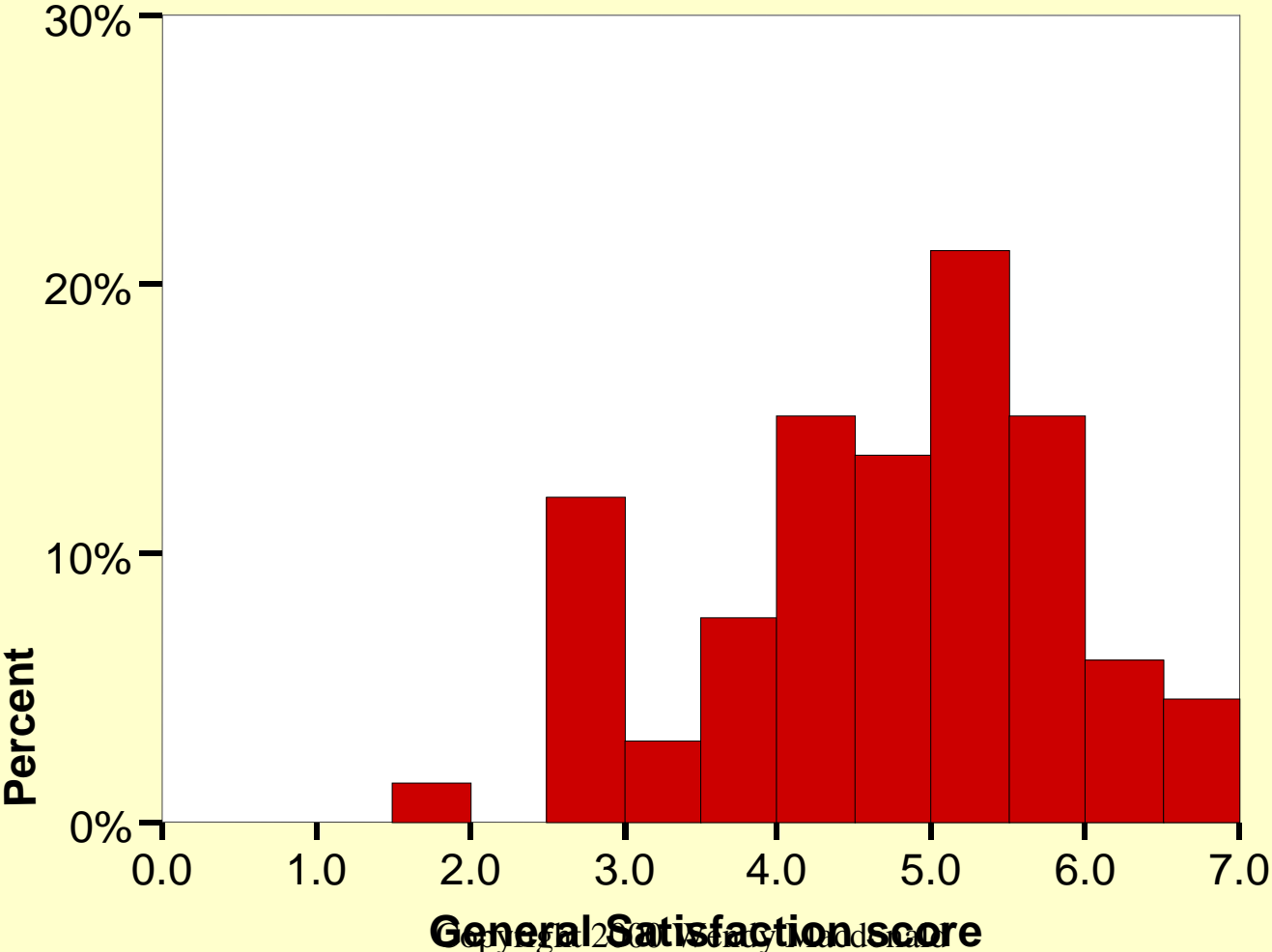
**86% felt that they had at least some say in
changing how the task was done**

Satisfaction with amount of 'say'

**62% were satisfied with their overall amount
of 'say'.**

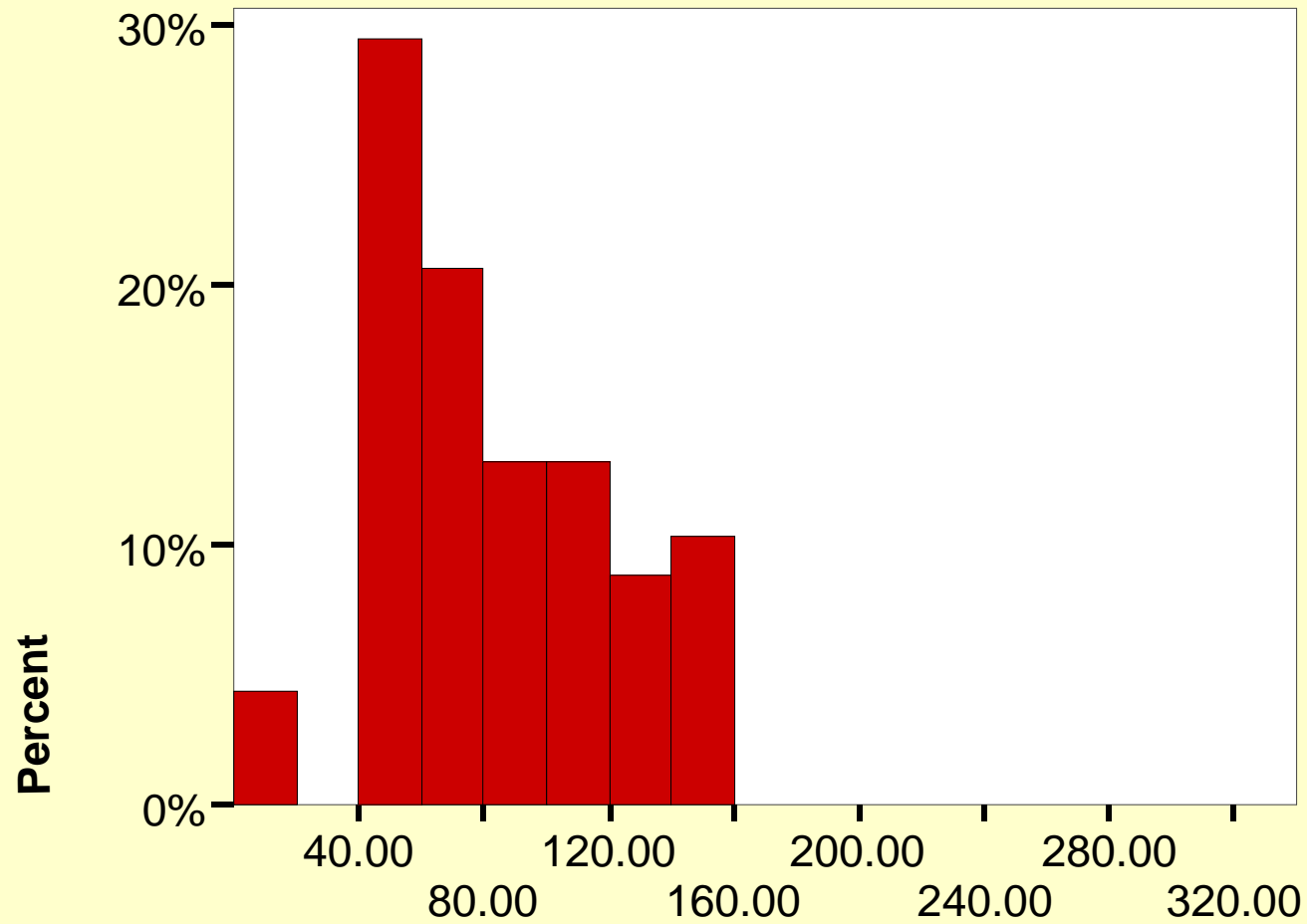
PARTICIPATION & SATISFACTION ... continued

General Satisfaction



PARTICIPATION & SATISFACTION ... continued

Motivating Potential Score



WORK RATES

Setting A Standard Rate: Used **FORMAL** Methods

- **48% of all tasks**
- **time study** (often quite informal) - **34.5%**
- **standard times** - either industry standards, or a PMTS such as Modapts - **13.5%**

Work Rates: ... continued

Setting A Standard Rates: Used INFORMAL Methods

- **52+% of tasks**
- **Past experience of the manager or supervisor – often reported as main basis for setting work rates.**
- **Trial and error**

NB: Machine or production process time limited the variation possible.

Work Rates: ... continued

Major Factors That 'Pace' Work - including 'Standard' Rates

- **machine operating or production process time**
– **62.3%** of tasks (including 13.5% of tasks with a moving 'line' speed, and 16% 'end of line' tasks)
- **production targets – 70%** of tasks
- **production orders and related deadlines – 46%** of tasks.

Work Rates: ... continued

Factors Affecting *Actual* Rates

- **73%** slowing to look for rejects, maintain quality
- **62%** affected by personal standards regarding work rate, or by social norms (particularly the former)
- **29%** in response to perceived management attitudes (about equal numbers reporting faster or slower rates).

Work Rates: ... continued

Other Factors Affecting *Actual* Rates

- to finish an order by a set time
- to deal with a large backlog
- to supply people in another section of the plant
- process hold-ups, machine problems
- poorer quality of materials, products
- lower than normal staffing level

Work Rates: ... continued

Employee Ratings of Work Rates

- **65%** of employees surveyed rated their target or line speed as **‘about right’**.
- **30%** rated them as **too high**
- **5%** rated them as **too low**.

Work Rates: ... continued

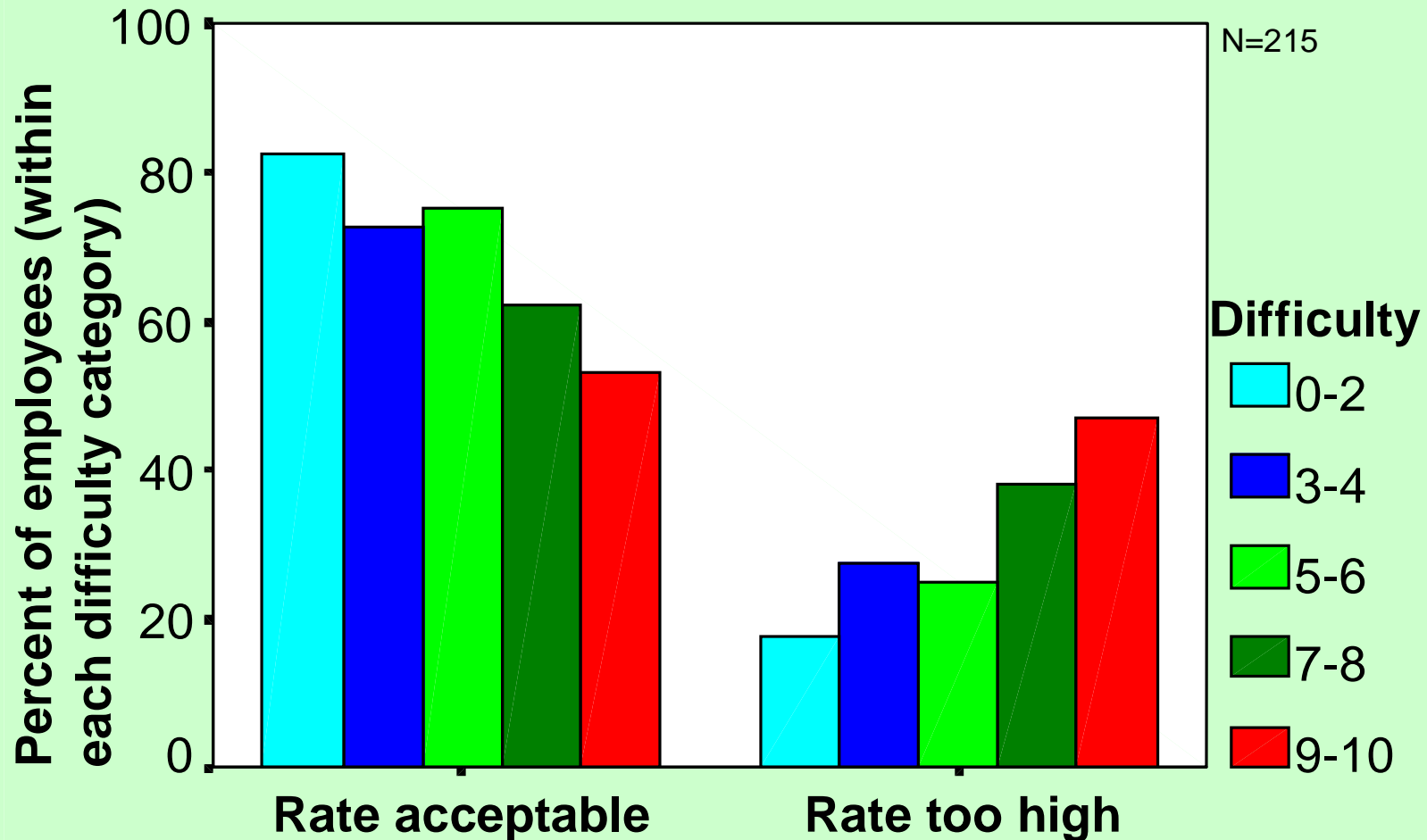
Work rate (target, line speed) were rated more acceptable with:

- low task difficulty
- high ratings of overall say*
- quality more important
- low fatigue

* targets only

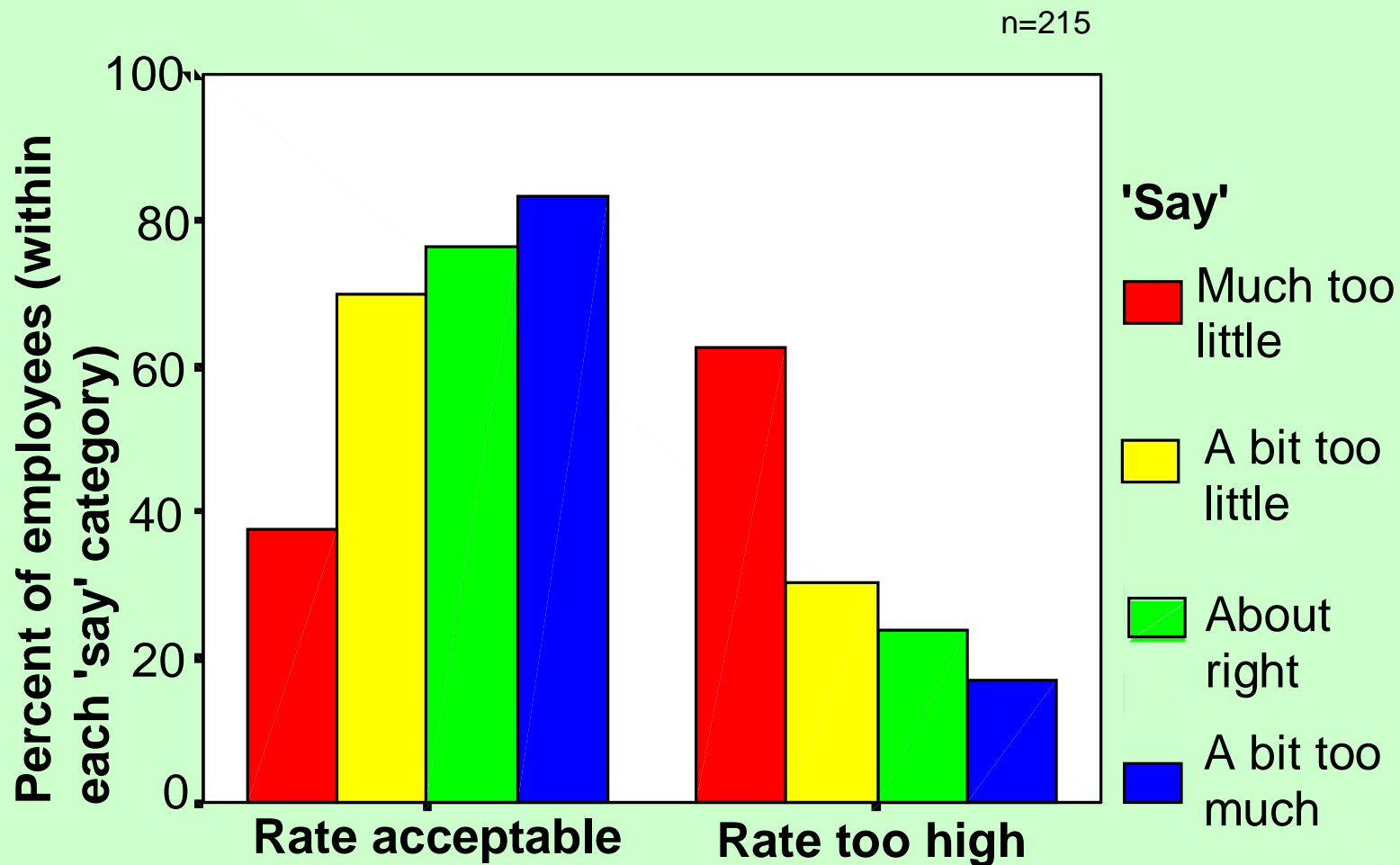
Work Rates: ... continued

Overall Task Difficulty ratings for tasks with 'acceptable' and 'too high' rates

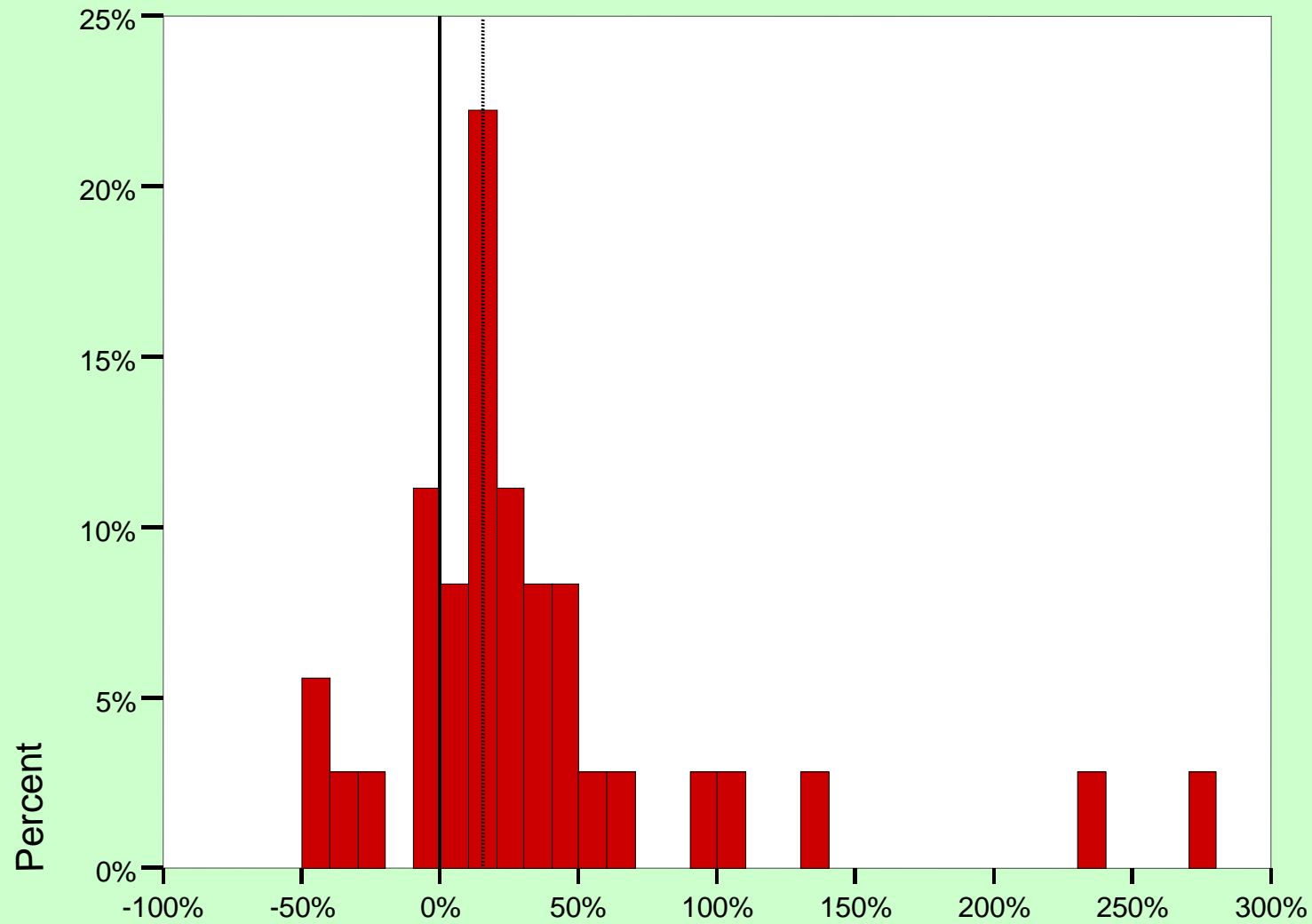


Work Rates: ... continued

Satisfaction with the amount of 'say' related to work rate acceptability



Difference between Observed and Modapts time



faster <-- standard --> slower

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STRESS

Two dimensions measured:

‘Stress’ - negative emotions

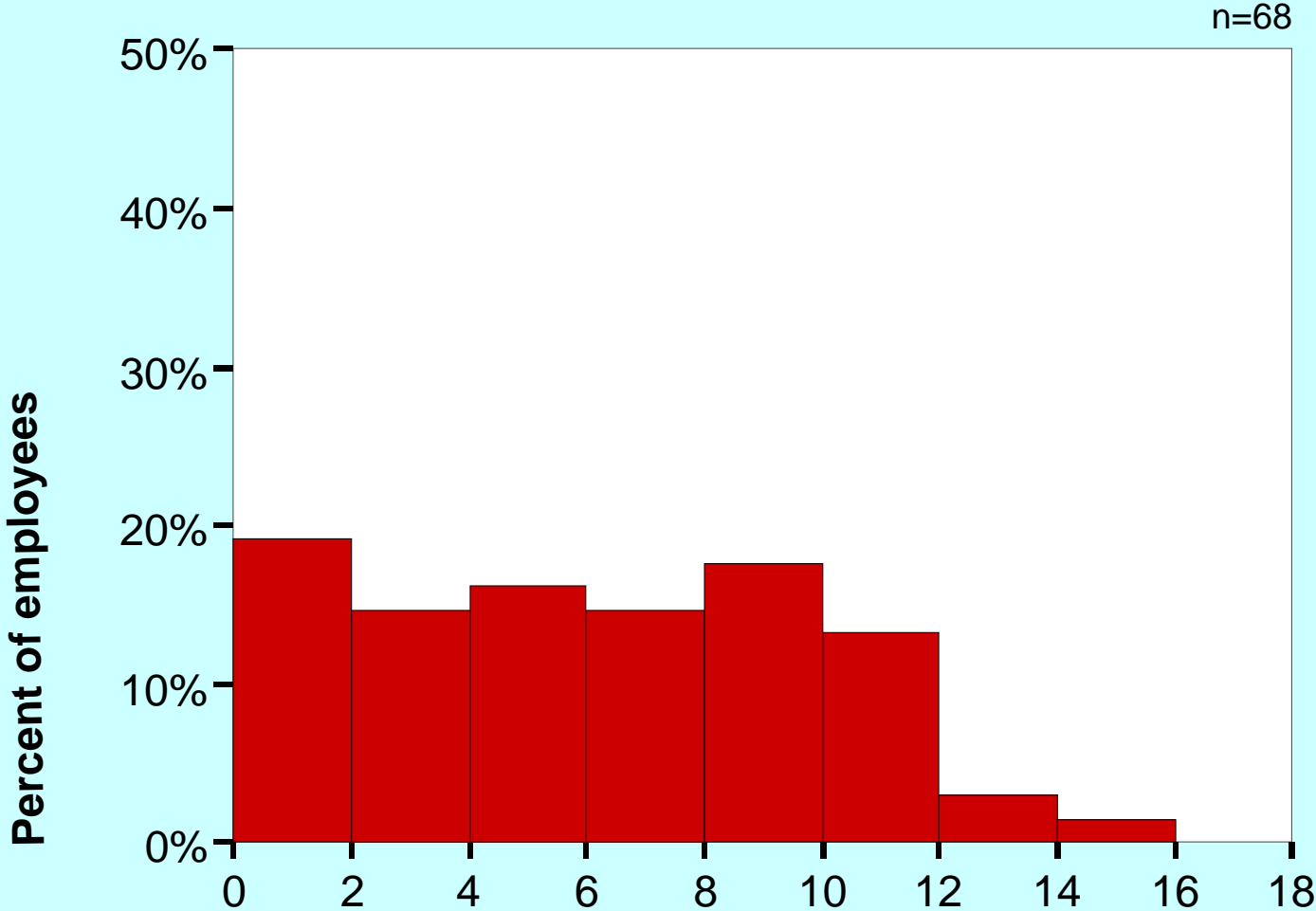
‘Arousal’ - sleepy/active

‘Stress’ levels were average

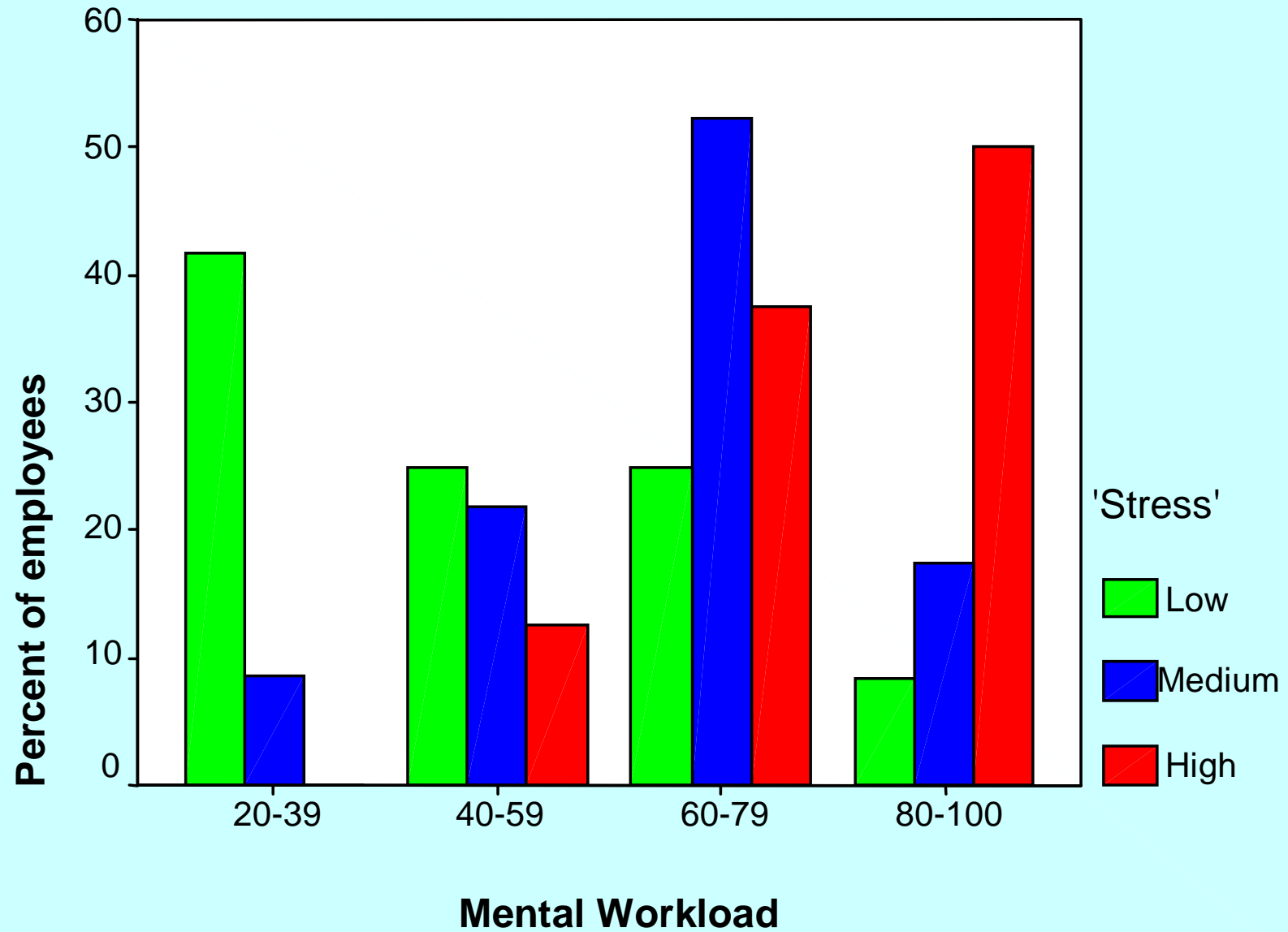
‘Arousal’ levels were high

STRESS: ... continued

'Stress'



'Stress' related to Mental Workload



STRESS: ... continued

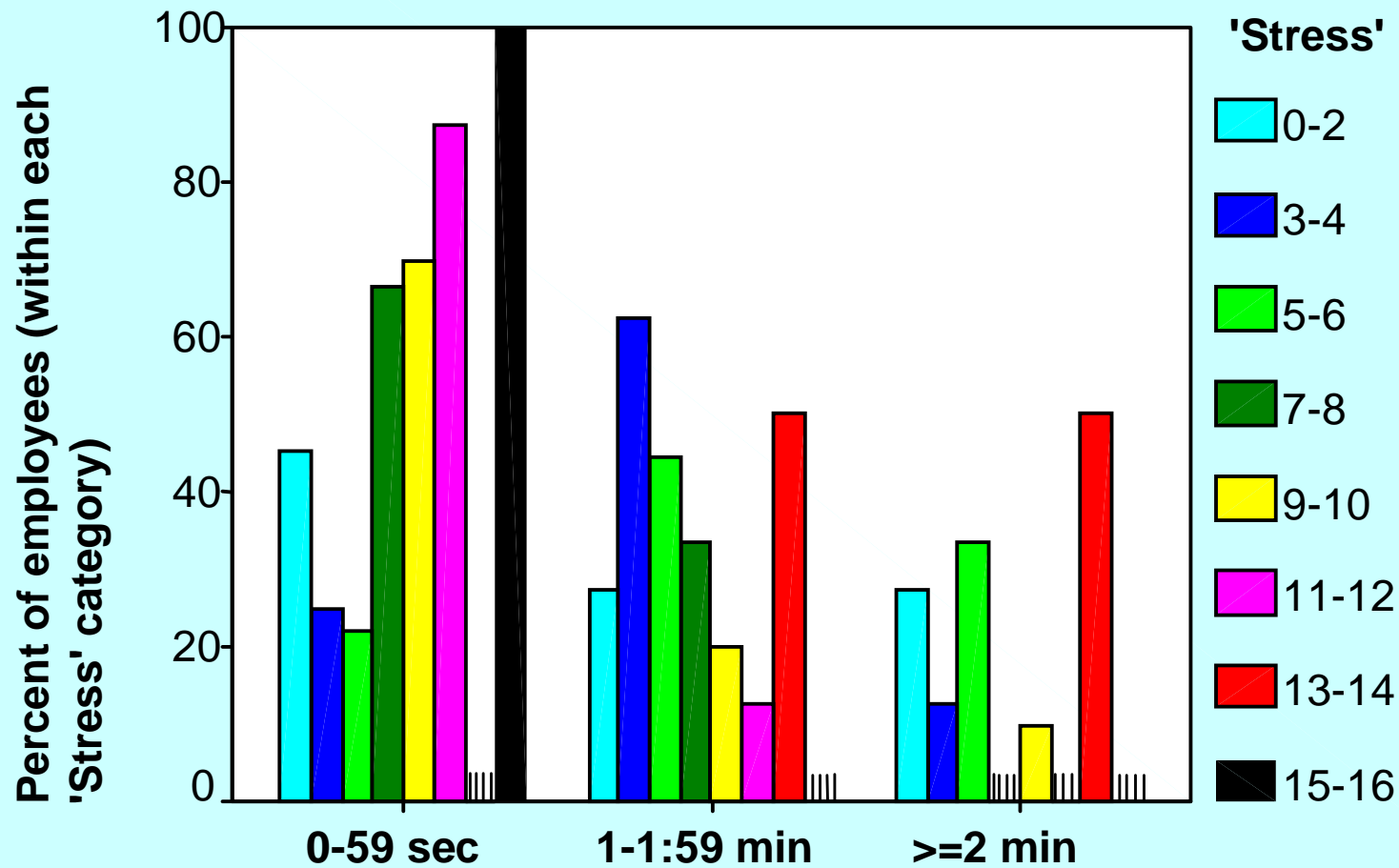
Stress score was higher with:

- *high* **mental workload**
- *low* **Motivating Potential Score**
- *short* **task cycle time**
- **work rate affected by production process or machine time, or line speed**

STRESS: ... continued

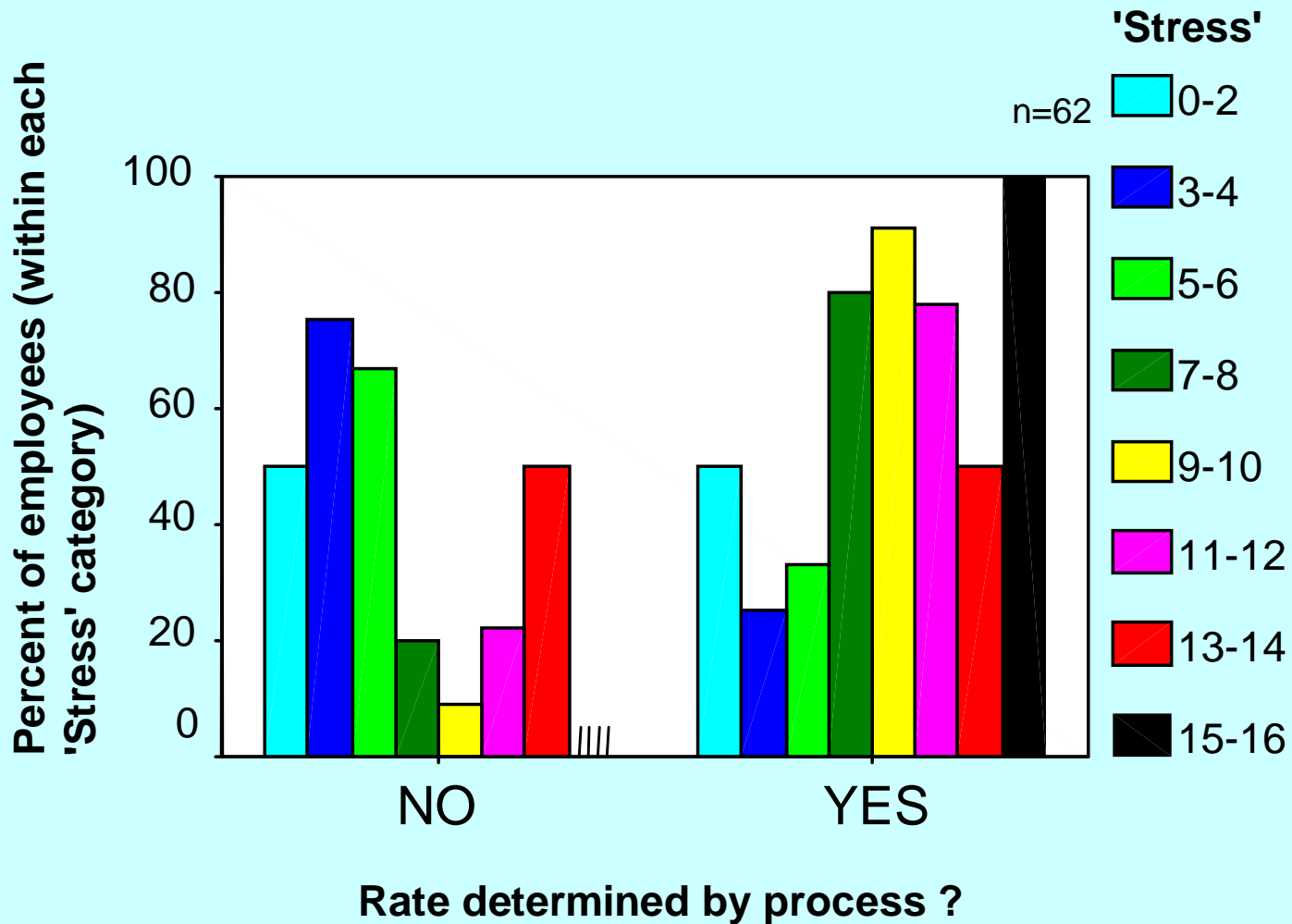
'Stress' for tasks with different cycle times

n=58



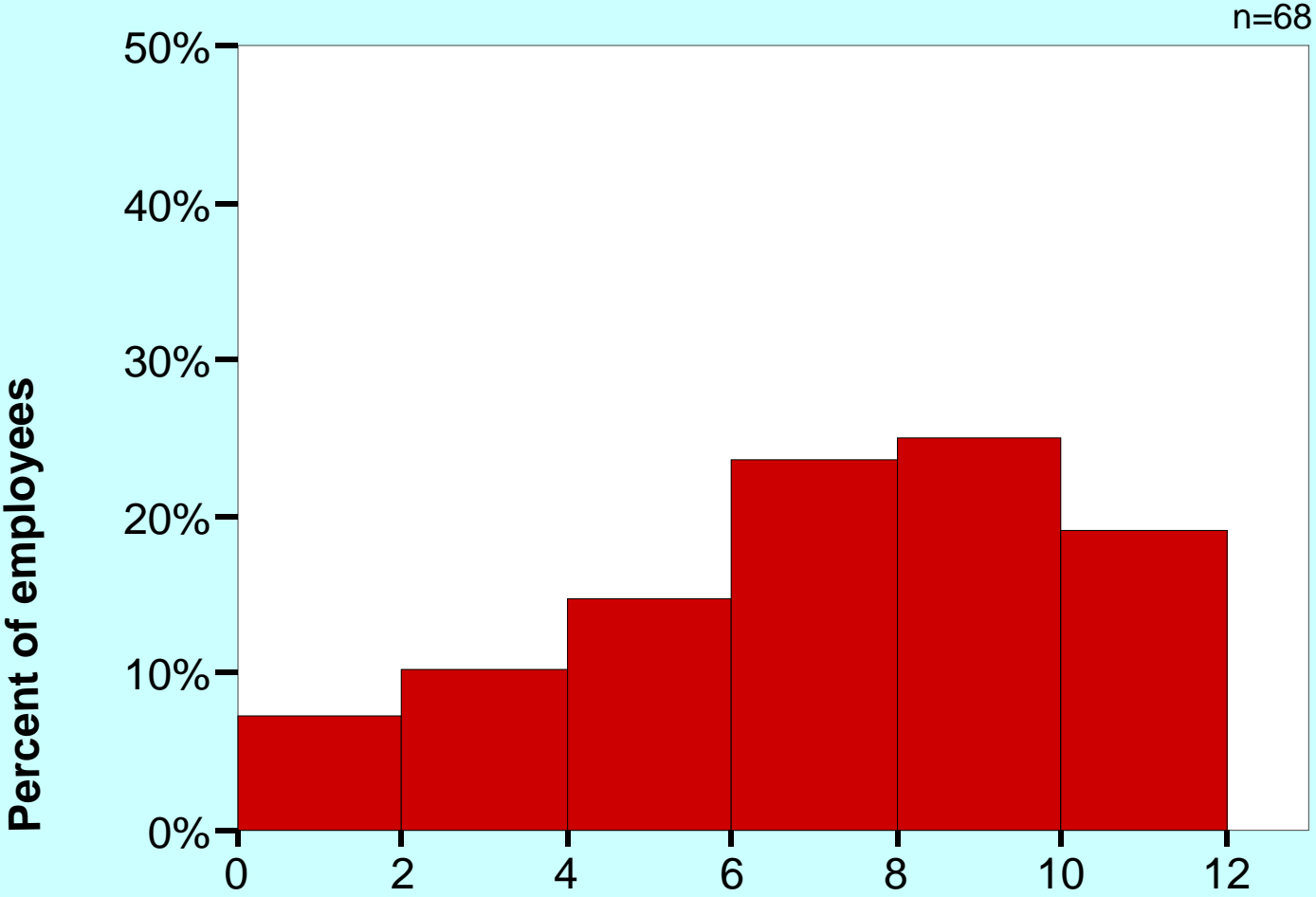
STRESS: ... continued

'Stress' separately for tasks where rate is/isn't determined by production process



STRESS: ... continued

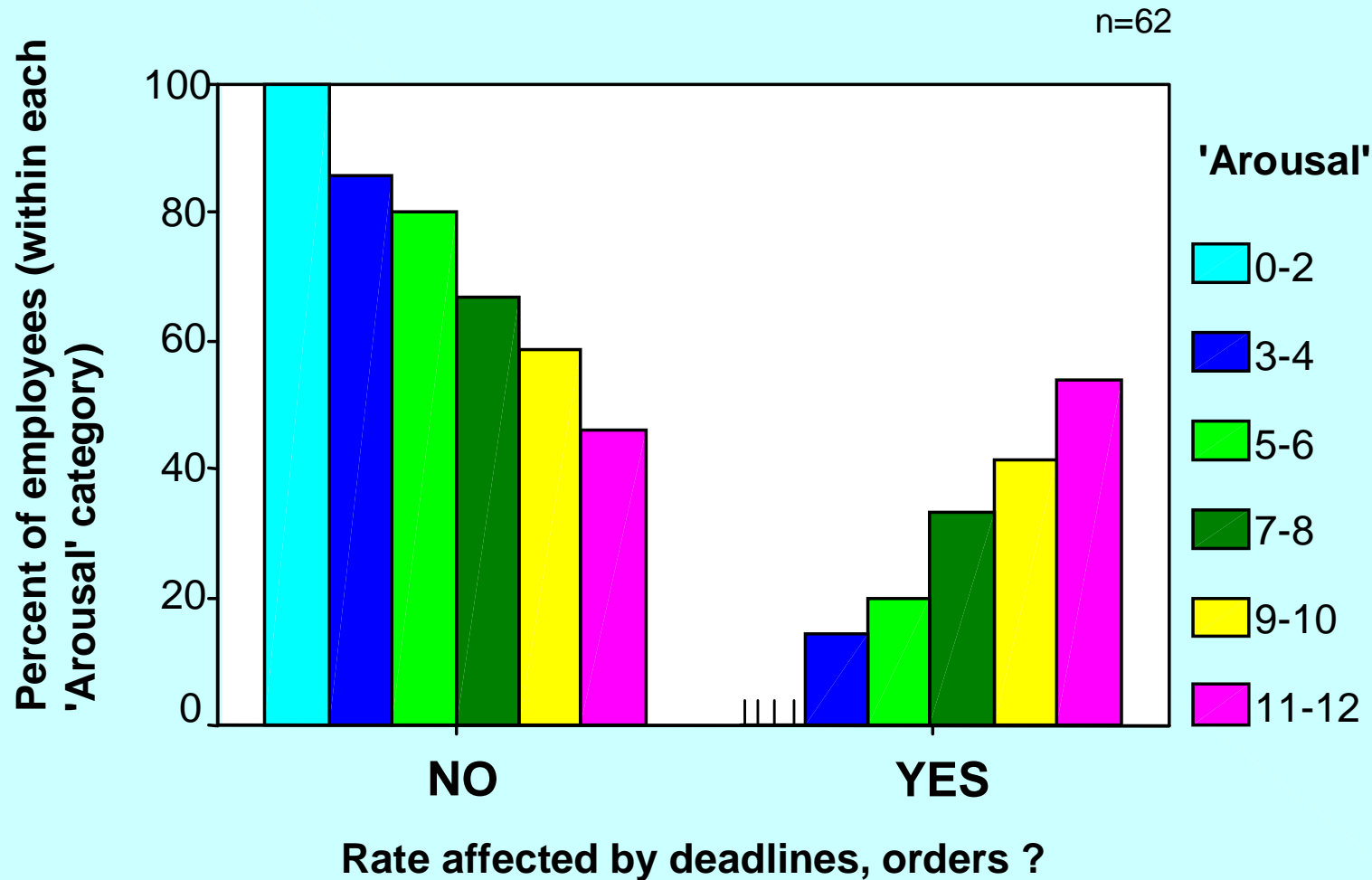
'Arousal'



n=68

STRESS: ... continued

'Arousal' separately for tasks where rate affected by deadlines or orders

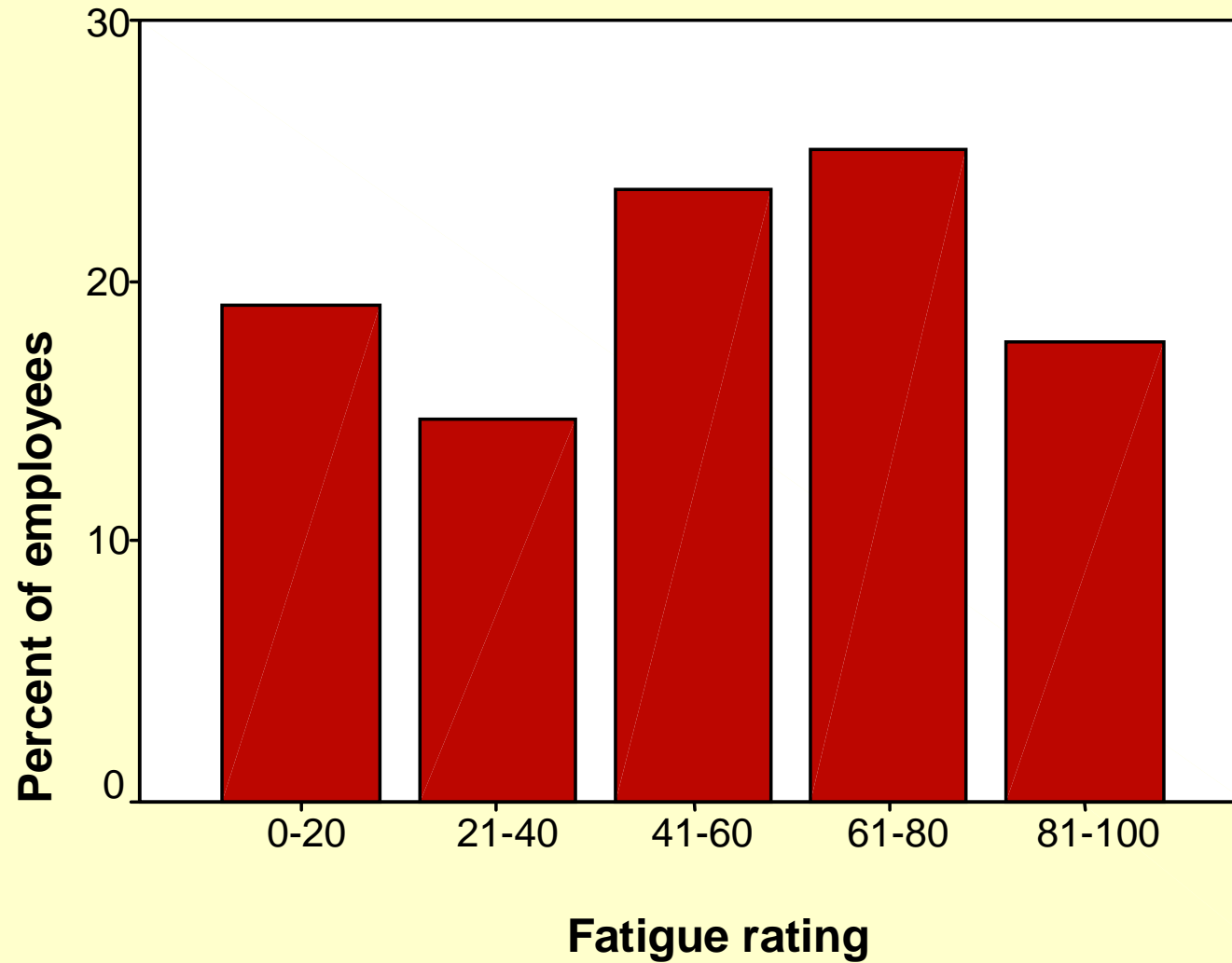


STRESS: ... continued

‘Arousal’ score was higher with:

- **work rate influenced by orders, deadlines**
- **high effort rating**
- **high Motivating Potential Score (MPS)**
- **high Total Task Demand Score**
- **high rating on ‘working carefully to avoid errors’**
- **high Postural Stress Score**

FATIGUE LEVELS



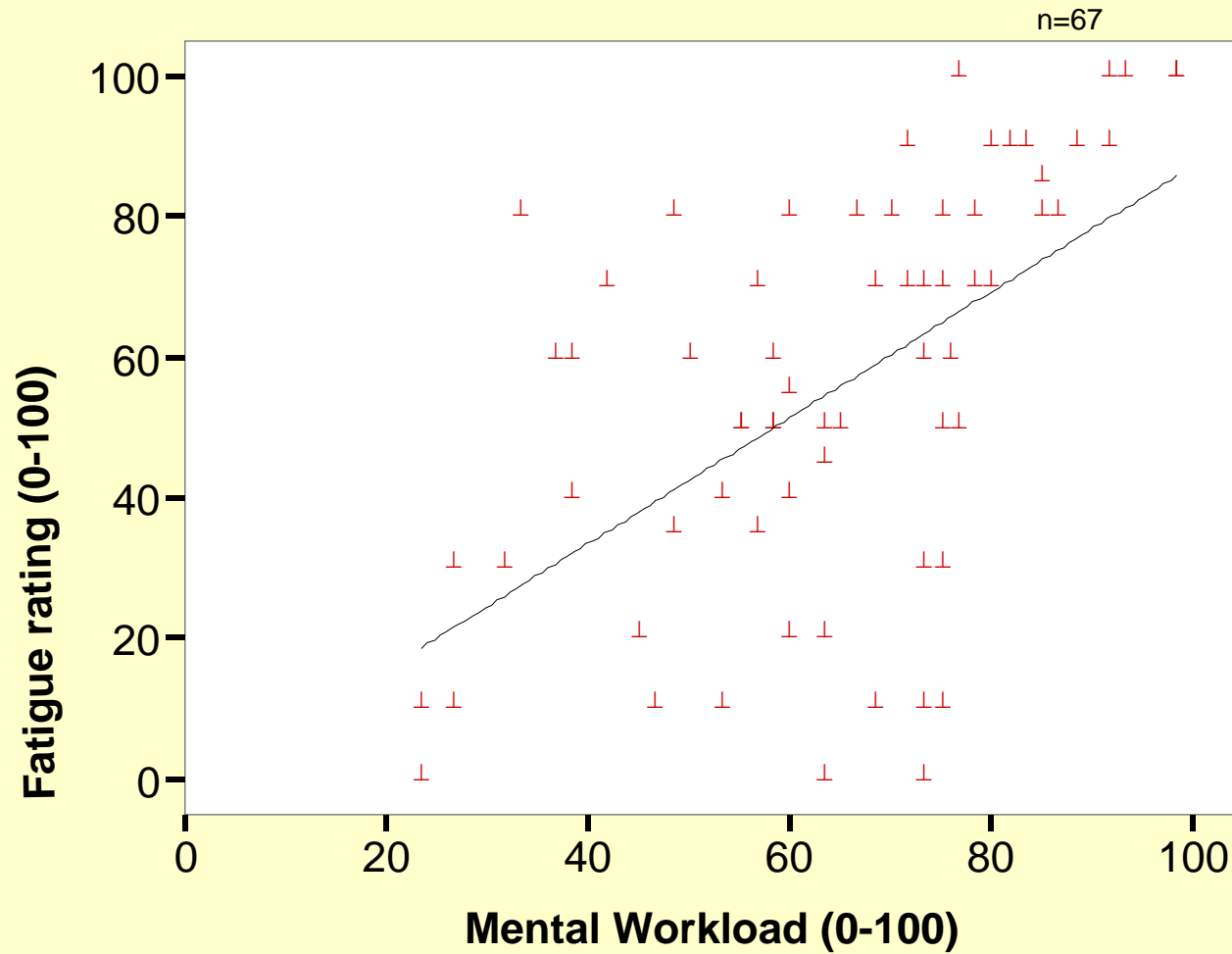
FATIGUE ...continued

Fatigue was higher with:

- **High Mental Workload score**
- **Low General Satisfaction score**
- **‘Too High’ work rate**
- **Absence of orders or deadlines
influencing work rates**

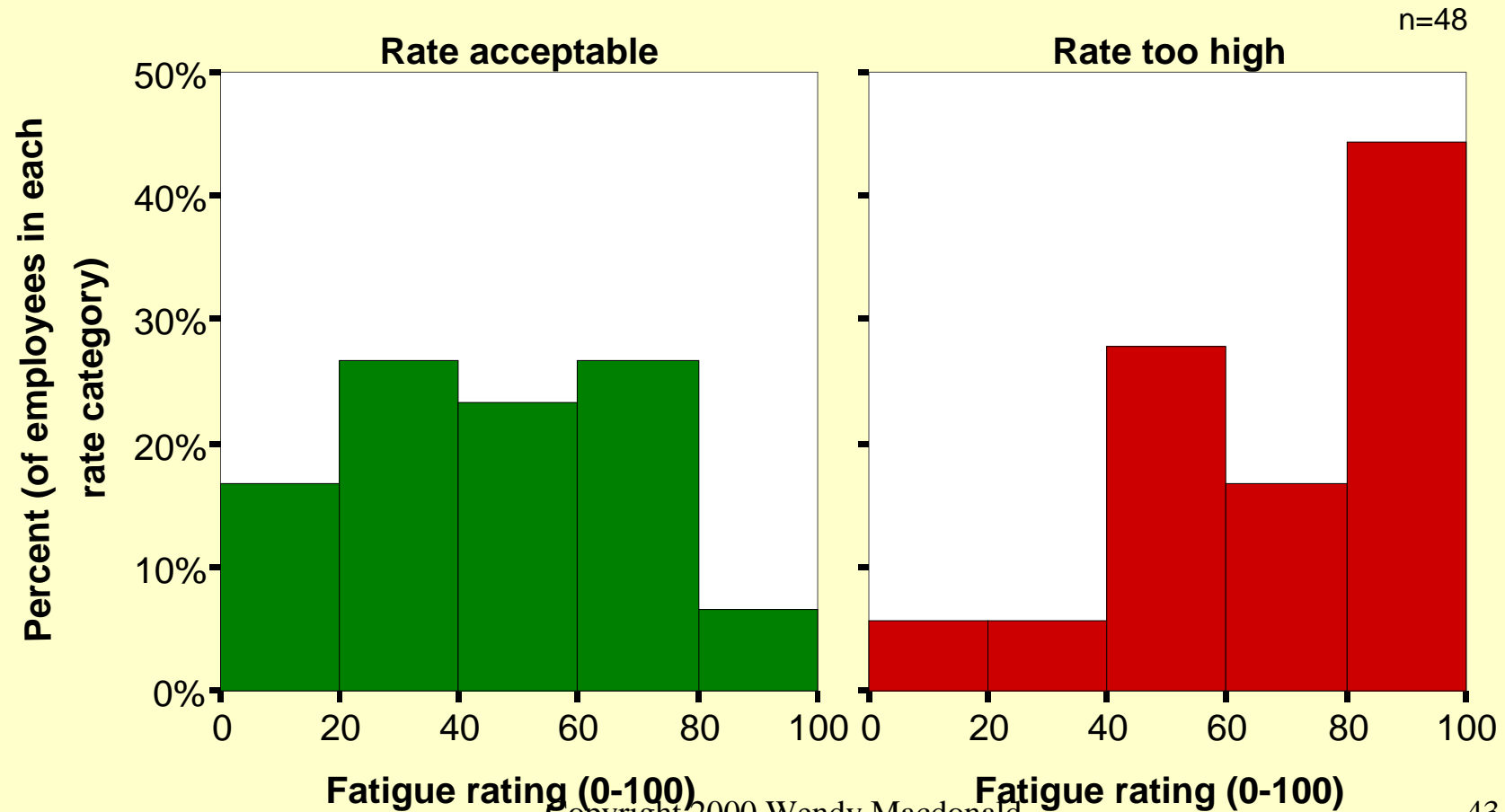
FATIGUEcontinued

Fatigue related to Mental Workload

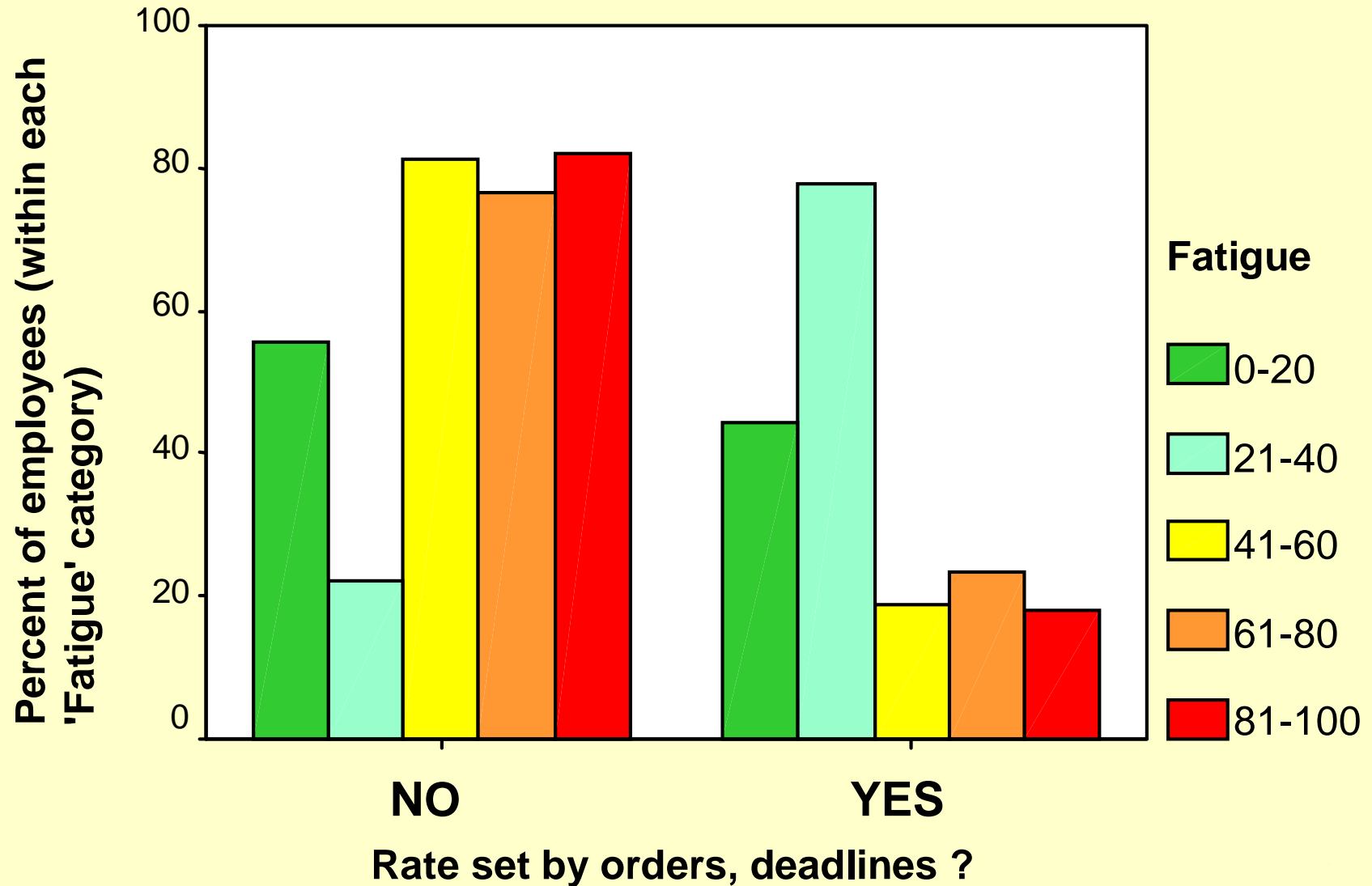


FATIGUE ...continued

Fatigue rating separately for tasks where rate is 'acceptable' and 'too high'



Fatigue ratings separately for tasks where rate is/isn't set by orders or deadlines



SO WHAT?

Practical Implications

- 1. Better assessment of task demands**
- 2. Improve work methods**
 - to increase efficiency**
 - to optimise task demands**
- 3. Use employee expertise - participation**
- 4. Get employee feedback**
- 5. Consider using formal methods**