

# Strain Index and OCRA Checklist Risk Assessments: Inter-method and Inter-rater Reliability

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## ERGONOMICS → MUSCULOSKELETAL DISORDER PREVENTION

### Physical risk factors

- High exertion forces
- High repetition
- Non-neutral posture
- Lack of breaks/rest

INTERACTIVE EFFECTS



# HOW MUCH RISK IS TOO MUCH?

## Strain Index & OCRA Checklist

1. Popular general upper limb risk assessments
2. Consider multiple risk factors
3. Rank jobs according to risks

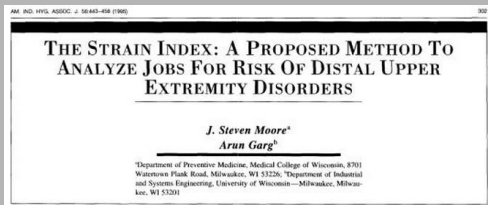


## PURPOSE OF THE STUDY

**Inter-method reliability:** Do both methods assess risk similarly?

**Inter-rater reliability:** Are measures consistent between raters?

Strain Index ↔ OCRA Checklist



## METHODS—CONTEXT

21 Jobs



32 Unique  
Limb  
Exposures



7 Raters

4 OCRA  
Checklist

4 Strain  
Index

3 Strain  
Index

3 OCRA  
Checklist

## METHODS—STRAIN INDEX

- Intensity of hand forces
- Duration (per cycle) of hand forces
- Repetition of hand forces
- Posture at the wrist
- Speed of work
- Duration of work/day

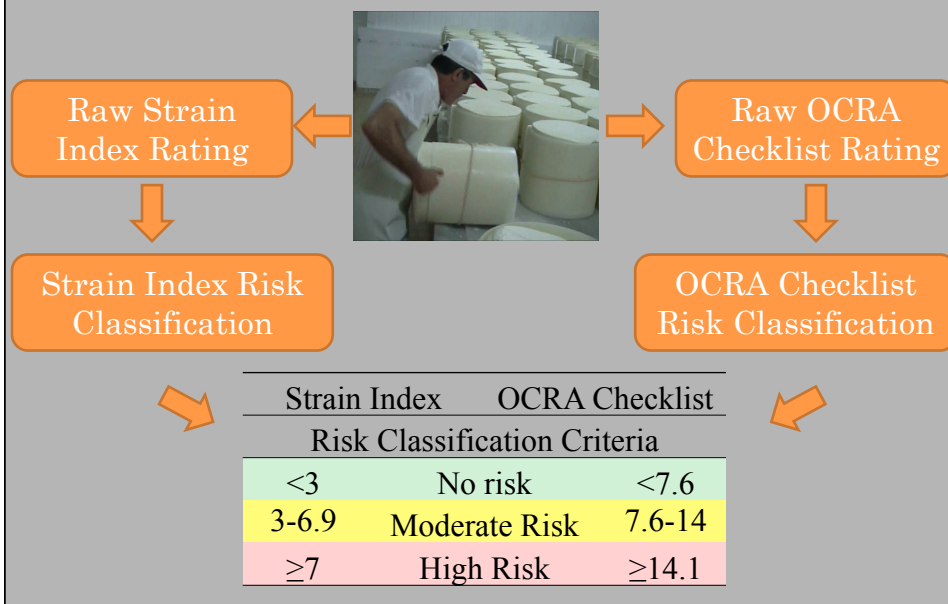


## METHODS—OCRA CHECKLIST

- Frequency of technical actions
- Intensity and duration of force
- Posture of the fingers, wrist, elbow, and shoulder
- Lack of recovery
- Task duration
- Additional physical & organizational factors



## METHODS—DATA ANALYSIS



## METHODS–DATA ANALYSIS

### Reliability Statistics

- Proportion of Agreement ( $p_o$ )
- Weighted Kappa coefficient ( $\kappa_w$ )
- Pearson Correlation ( $r$ )

Strain Index	OCRA Checklist	
Risk Classification Criteria		
<3	No risk	<7.6
3-6.9	Moderate Risk	7.6-14
≥7	High Risk	≥14.1

## PROPORTION OF AGREEMENT

$$p_o = 65.6\%$$

		Strain Index			Total
		No Risk	Moderate Risk	High Risk	
OCRA Checklist	No Risk	22 9.8%	25 11.2%	8 3.6%	55 24.6%
	Moderate Risk	9 4.0%	24 10.7%	26 11.6%	59 26.3%
	High Risk	1 0.5%	8 3.6%	101 45.1%	110 49.1%
Total		32 14.3%	57 25.5%	135 60.3%	224 100%

Similar Strain Index and OCRA method comparisons

•Apostoli *et al.*, 2004,  $p_o = 41.7\%$

•Jones and Kumar, 2010,  $p_o = 83\%$

•Chiasson *et al.*, 2012,  $p_o = 60.1\%$

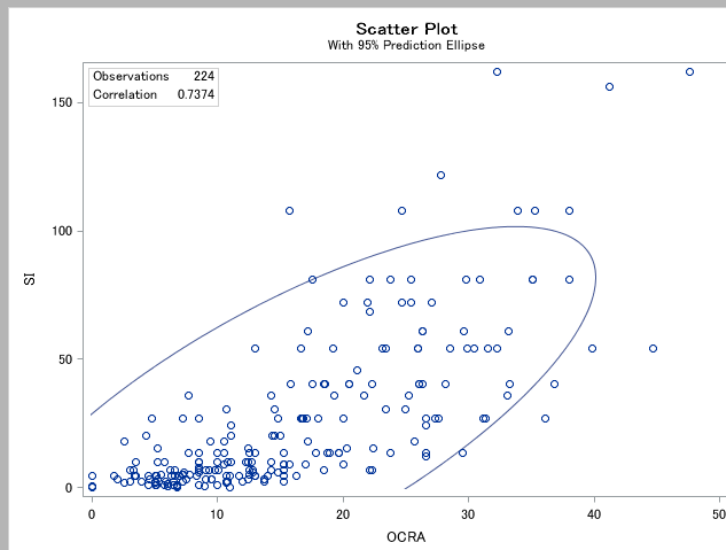
## Weighted Kappa

$$\kappa_w = 0.63 \quad (95\% \text{ CI: } 0.54\text{-}0.71)$$

Kappa	Agreement
<0.00	Less than Chance Agreement
0.01-0.20	Slight Agreement
0.21-0.40	Fair Agreement
0.41-0.60	Moderate Agreement
0.61-0.80	Substantial Agreement
0.81-0.99	Almost Perfect Agreement

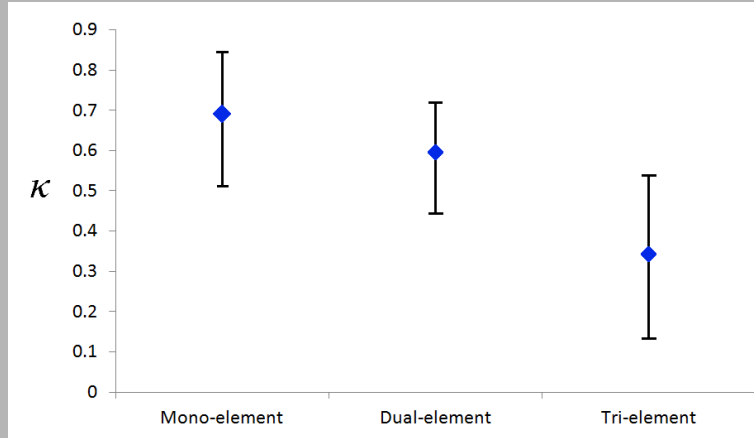
## Pearson Correlation

$$r = 0.74 \quad (95\% \text{ CI: } 0.67\text{-}0.79)$$



## RESULTS AND DISCUSSION: EFFECT OF JOB COMPLEXITY

Strength of agreement between Strain Index and OCRA Checklist exposure classifications (by task complexity)



## RESULTS AND DISCUSSION: INTER-RATER RELIABILITY

Exposure scores	*ICC, $\rho$	95% CI for $\rho$
Strain Index		
Risk Index (continuous)	<b>0.59</b>	0.45-0.73
Three-level risk classification	0.54	0.40-0.70
OCRA Checklist		
Risk Index (continuous)	<b>0.80</b>	0.70-0.89
Three-level risk classification	0.68	0.56-0.80

\*Intraclass correlation coefficient (ICC) calculated using random effects analysis of variance model

## CONCLUSIONS:

- Strain Index and OCRA Checklist are reliable measures of ergonomic risk in ewe cheese production.
- Choice of method should be based on purpose of risk assessment.



**THANK YOU!**

**COMMENTS OR QUESTIONS?**

