

Actual vs. Reported Treadmill Speed under Various Conditions: A pilot study.

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Literature Review

- Treadmill use in healthcare
 - Stress tests (Bruce protocol),
 - Cardiac rehab
 - Endurance/aerobic training
 - VO2max testing
 - Gait analysis

Clinical Question

- Is the reported speed of the treadmill close to the actual speed the belt is moving?
- Does weight/grade affect the actual speed of the treadmill belt?
- Are our patients really exercising at the speed the treadmill monitor displays?

Study Design

- **Potential Variables:** speed, grade, and subject weight
- **Tools:** Precor C934 treadmill, Kernco DT-2235A tachometer (ft/min)
- **Population:** 18-35 year old males with ability to run
- **Controls:** consistent data collector, same treadmill, blinded tachometer operator



<http://www.kerncoinstr.com/images/21c13.jpg>

Exclusion Criteria

- Cardiac disease
- Orthopedic injury/surgery of the lower extremity within the last year
- Cognitive impairment affecting ability to follow directions
- Balance deficits
- Obvious abnormal running pattern

Variables

- | | | |
|----------------|----------------|-----------------|
| • <u>Speed</u> | • <u>Grade</u> | • <u>Weight</u> |
| 3 mph | 0% grade | <190 lbs |
| 6 mph | +10% grade | 190-240 lbs |
| | -10% grade | >240 lbs |

Hypotheses

- Actual belt speed will increase while subject is at 10% grade
- Actual belt speed will decrease while subject is at -10% grade
- Heavier participants will decrease actual belt speed

Methods

Calibration: Treadmill read 3.0 mph and 6.0 mph on both LCD and Tachometer prior to subject getting on treadmill

Time: 10 second intervals for each test



Methods

- Investigator #1:
 - Collected/recorded data
 - Monitored high value on tachometer
- Investigator #2:
 - Controlled treadmill settings
 - Monitored low value on tachometer
 - Operated stop watch
 - Blinded investigator #3
- Investigator #3:
 - Held tachometer
 - Monitored time intervals on stop watch



Results

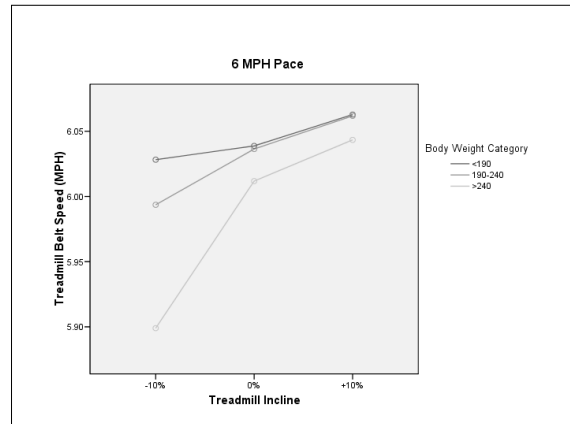
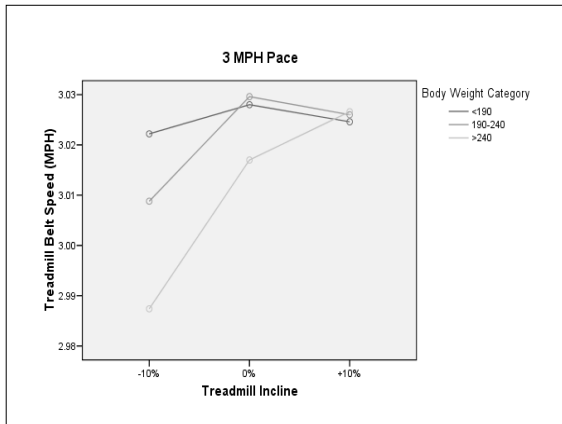
- A 3-way Mixed Model ANOVA was performed
 - Dependent variable: Treadmill Belt Speed
- The term "Mixed Model" simply refers to the fact that both within-subjects and between-subjects factors were evaluated

Results

- The within-subjects factors were running pace (3 MPH and 6 MPH) and treadmill incline (-10%, 0%, and +10%)
- The between-subjects factor was body weight category (<190, 190-240, and >240)
- The analysis can be described as a 2 X 3 X 3 Repeated Measures ANOVA
 - (Pace by Incline by Weight)

Results

- A significant 3-way interaction among factors was found ($p < 0.05$)
- As runners' weight increased, the belt speed became slower during downhill running
 - Effect more pronounced at 6 MPH pace
- The belt speed became faster during uphill running for all 3 groups at the 6 mph pace
 - Only the heaviest group demonstrated increased belt speed during uphill running at the 3 MPH pace



Discussion

- Speed decreases on decline more significantly with higher weight subjects
- Speed slightly increases with incline
- Changes in speed more predictable at 6mph
- Data was statistically significant but not clinically significant

Limitations

- Only male subjects used
- No control for various running patterns
- Only one brand of treadmill examined
- Unsteady tachometer

Future Research

- Compare different quality treadmills
- Include females
- Reflective tape tachometer
- Look at other variables (HP, belt length, and stride length)

References

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