The Effect Of Biofeedback On Trunk Posture During The Lowering Phase Of Lifting

by

J T Johnson, PhD., B F Johnson, EdD., G E Moore, PhD., J A Doyle, PhD., E J Higbie, PhD., L L Tis, PhD.

University of West Georgia Department of Physical Education & Georgia State University Department of Kinesiology and Health

Necessity of Study

- Economic impact of low back pain/injury
- Previous techniques to reduce low back pain and injury due to lifting have been shown to be ineffective.
- What will work?

Research Question

Will a biofeedback device specifically designed to monitor lifting postures and alert the individual when they position themselves in a potentially injurious position elicit an appropriate response which may help reduce the severity and number of forward flexions during lifting tasks?

Variables

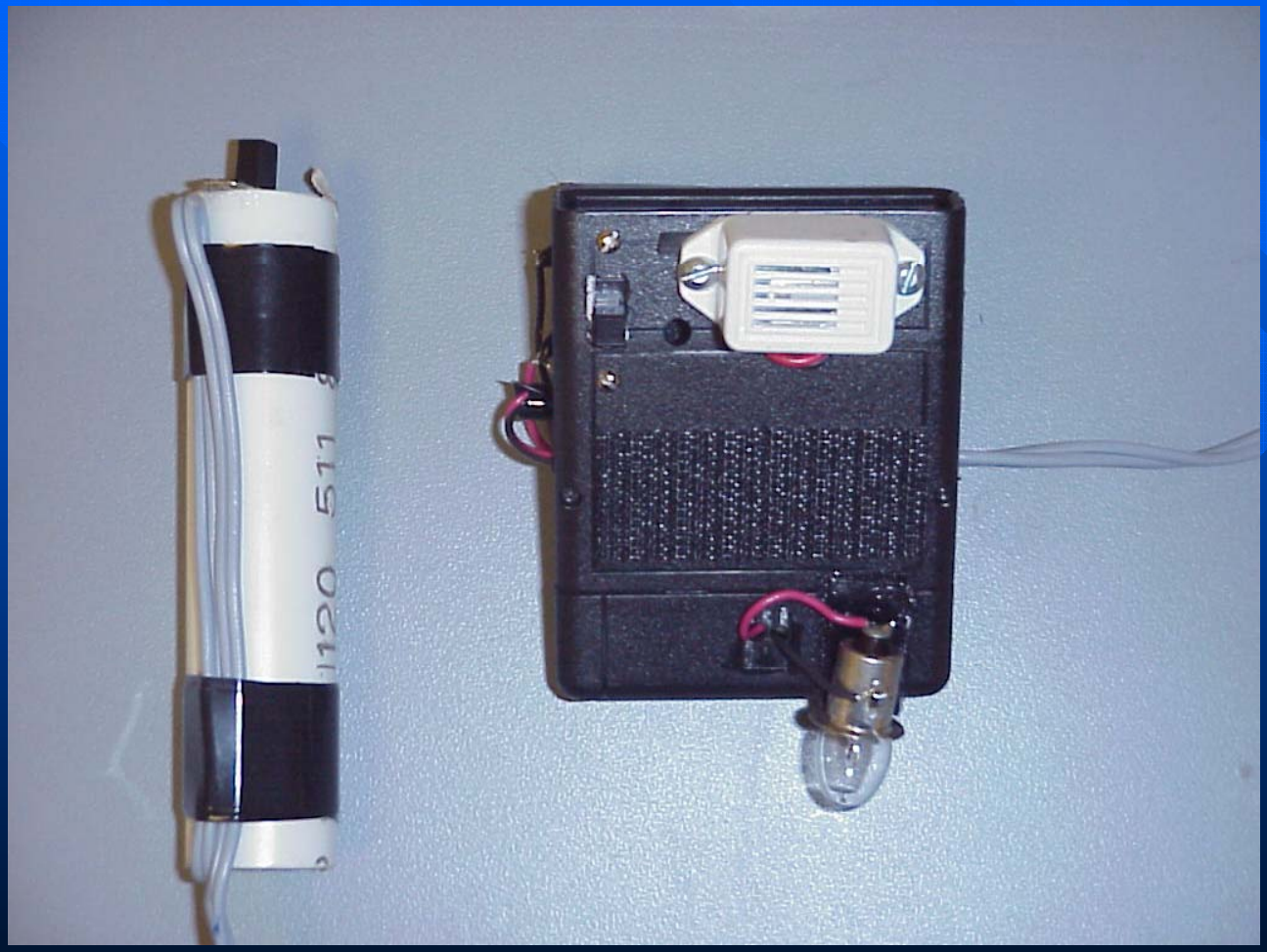
The dependent variables for this study were: the trunk angle at the bottom of the lift, and the number of violations (a violation is a potentially injurious position). The independent variables were the five trials.

Methodology - Subjects

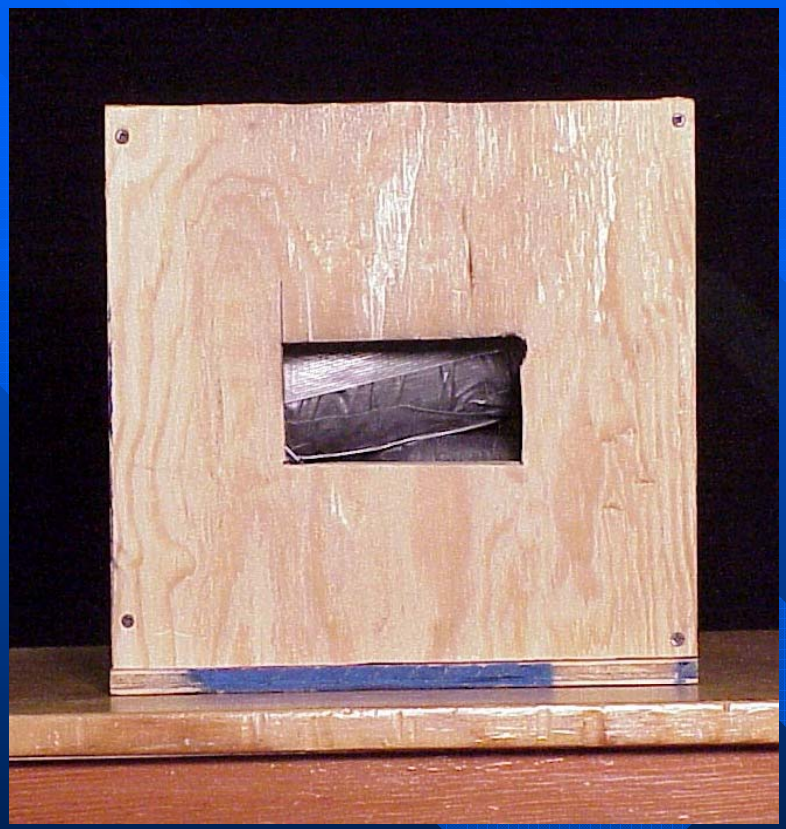
- 40 subjects (38 male, 2 female).

Variable	Minimum	Maximum	Mean	SD
Age	19.000	52.000	34.675	7.360
Height (in)	60.000	79.000	70.600	3.699
Weight (lbs)	130.000	290.000	197.525	40.344

The Device



The Box



Methods

- One 60 Hz camcorder placed 20 feet away videotaped the right sagittal plane of the body.
- Data were digitized and reduced using the Peak Performance Technologies, Inc. Motus system.
- The beginning position was designated as the first picture where downward motion of the box occurred, while the ending position was designated as the picture where the hands were released from the box.

Protocol - Pretrial

- The subjects were given time to familiarize him/herself with the box and the weight of the box.
- The subjects were given instructions as to when and where to start and stop the activity.

Protocol – Trial 1

- Baseline (non-alert).
- The subjects were told to start picking up the box and to continue until instructed to stop.
- 5 lifts were performed.

Protocol – Trial 2

- Device on (alert).
- The subjects were told they may hear a buzz/beep or feel a vibration during this set of trials and to start picking up the box until instructed to stop.
- 5 lifts were performed.

Protocol – Trials 3 & 4

- Randomized Alert on or Alert off.
- The subjects were “educated” as to the purpose of the device and told to begin picking up the box until instructed to stop.
- 5 lifts were performed.

Protocol – Trial 5

- Posttest (non-alert).
- The subjects were asked to pick up the box again until instructed to stop.
- 5 lifts were performed.

Statistical Analysis

- Means were calculated for each variable across the 5 lifts for each trial.
- 5 one-between and one-within repeated measures ANOVAs were employed to analyze the data.
- Tukey post-hoc procedures were employed to test differences between each trial.
- A Bonferonni adjustment (0.05/2) provided the individual test α of 0.025.

Results – Means

Variable	Min	Max	Mean	SD
Device 1	0	5	4.42	1.30
Device 2	0	5	3.78	1.8
Device 3	0	5	2.3	2.27
Device 4	0	5	2.78	2.22
Device 5	0	5	2.75	2.25
Trunk 1	12	106.7	67.54	21.62
Trunk 2	14.7	96.4	62.89	22.57
Trunk 3	13.3	99.4	47.15	24.41
Trunk 4	7.6	98.9	48.91	22.68
Trunk 5	14.3	107.5	48.42	23.43

Results – Within-subject ANOVA

Variable	F ratio	P value
Device	24.441	<0.001
Trunk	25.818	<0.001

Results – Post-hoc for Device

Trials	Difference Score	P < 0.025
Device on – Baseline	-0.65	No
Alert on – Baseline	-2.12	Yes
Alert off – Baseline	-1.64	Yes
Posttest – Baseline	-1.67	Yes
Alert on – Device on	-1.47	Yes
Alert off – Device on	-0.99	Yes
Posttest – Device on	-1.02	Yes
Alert off – Alert on	0.48	No
Posttest – Alert on	0.45	No
Posttest – Alert off	-0.03	No

Results – Post-hoc for Trunk

Trials	Difference Score	P < 0.025
Device on – Baseline	-4.6 degrees	No
Alert on – Baseline	-20.3 degrees	Yes
Alert off – Baseline	-18.6 degrees	Yes
Posttest – Baseline	-19.1 degrees	Yes
Alert on – Device on	-15.7 degrees	Yes
Alert off – Device on	-14.0 degrees	Yes
Posttest – Device on	-14.5 degrees	Yes
Alert off – Alert on	1.7 degrees	No
Posttest – Alert on	1.2 degrees	No
Posttest – Alert off	-0.5 degrees	No

Conclusions

- There were significant differences between all pre-education and post-education trials for both dependent variables.
- There were no significant differences among any pre-education or post-education trials for any variables, although the trend was less violations when the device was alerting the individual.
- The device was successful in reducing the amount and severity of forward flexions during the lowering phase of a lifting task.

Thank you for your attendance.