MOVING WEIGHTS AT THE SAME HEIGHT--
EFFECT OF HEIGHT, ANGLE OF MOVEMENT AND OBJECT VOLUME

by

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B.A., Kansas Wesleyan, 1974

A MASTER'S THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Department of Industrial Engineering

KANSAS STATE UNIVERISTY
Manhattan, Kansas

1976

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Acknowledgements

The author wishes to thank his major professor, Dr. Stephan Konz, for his guidance and support throughout this study. He would also like to thank Kobie Coetzee for his assistance and suggestions. The statistics lab is also due thanks for helping set up the statistical analysis. And last but not least he would like to thank his parents, to whom he dedicates this work, for their continued support and encouragement throughout his schooling.

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INTRODUCTION.

The reason for studying lifting is the number of injuries received from lifting in industry. The five types of injuries are: (1) back injuries, (2) abdominal hernias, (3) falls, (4) foot injuries, and (5) aggravation of circulatory disorders.

Back injuries.

Bond (1970) states that about 2% of all employees will have a compensable back injury every year. McGill (1968) reported that in the state of Washington 24% of the total days lost due to accidents are due to industrial back problems. The lifting of excessively heavy loads can cause acute or chronic injury to the back muscles (sacrospinalis). The risk of injury during heavy lifts increases with age due to the degenerative process of the back (Anon., 1970).

Kraus (1967) surveyed the causation and duration of symptoms of low back pain in 5000 patients; 80% of the cases were due to muscle strain. A chronic backache may be due to pregnancy in women or prolonged bending or lifting in either sex (Ingpen and Burry, 1970).

Abdominal hernias.

Abdominal hernias of various types can occur due to excess strain during heavy lifting.

Falls.

One of the most common causes for accidents in work involving lifting is the loss of balance during a moderate or heavy lift (Brown, 1958).

Foot injuries.

As stated by Noro (1967), there is a risk of injury to the bones of the feet; fractures of small metatarsus bones are especially common if

heavy lifting and carrying is done for long periods of time. In addition, during the process of lifting heavy objects, there is a chance of dropping the object on the foot.

Aggravation of circulatory disorders.

Sudden heavy lifting has an influence on the circulatory system due to the increased pressure in the thorax cavity, which in turn causes the blood pressure to rise. In addition, the pulse rate increases.

The correct technique for lifting as documented in the pamphlet "Lifting in Industry" and in the film "A New Way to Lift" (Anon., 1970) is:

(1) Position of the feet - Good lifting posture starts with the feet. The feet must be far enough apart to give a balanced distribution of the weight. As a general rule the leading foot should be the foot in the direction of the movement. For a straight ahead lift, the feet should be aligned (Konz and Bhasin, 1974).

(2) Hips, knees, and back - The knees and hips should be bent, and the back should be as straight as possible. As stated by Davis and Troup (1964), the straight-back method offers considerable advantages over the flexed-back method, but when lifting heavier loads the subject tends to switch to the flexed-back method. This suggests that heavy loads should be used for training and a careful watch kept to avoid this dangerous conversion.

(3) Arms - The arms should be held as near to the body as possible to minimize the moment arm between spine and load. In addition, holding the load as close to the body as possible allows the friction between the load and the clothing to help sustain the load during the carry.

(4) Grasps - While these vary for different tasks, whenever possible use the whole of the hand, not just the fingers.

As stated by Himburry (1967), the kinetic method of lifting is based on two principles: a) full use of strong leg muscles rather than weak back muscles; b) use of body weight momentum to initiate horizontal movement. A man can transport approximately 180,000 kg a day through a horizontal distance of one meter (McFarland, 1969).

PROBLEM.

For horizontal transfer of loads, how are the peak forces, torques, and subject vote affected as the angle of rotation, height of movement, and volume of box are varied?

METHOD.

Task.

Each subject moved a 5 kg tote box from shelf A on the right to shelf B on the left. Shelf A and B were at the same height. The three heights used were floor, knee, and hip, and the four angles of rotation were 45^{o}, 90^{o}, 135^{o}, and 180^{o}. See Figure 1. The two box volumes were 15 cm X 15 cm X 15 cm and 30 cm X 30 cm X 30 cm. The center of the box was transported approximately 51 cm (20 in) from the body center line, assuming the body center line is perpendicular to the ear lobes of the subject.

The foot position was held constant throughout each lift. The left foot led the right foot by 20 cm (8 in) from heel to heel; there was 15 cm (6 in) from instep to instep to minimize the stress on the muscles and ligaments (Bhasin, 1974). For the floor height transfer, the knees were bent and the buttocks were approximately knee height with the back as straight as possible. For the hip height transfer, the back was straight. The transfer was done at a smooth pace. A friction hand grip was used to simulate an industrial transfer. Figures 2, 3, and 4 show transfers at the three different heights, showing the posture for each.

Subjects.

Six female subjects were selected to meet the following requirements:

1) weight between 105 and 160 lb.
2) height between 60 and 70 in.
3) age between 18 and 40 yr.
4) physically fit and healthy.

See Table 1 for characteristics of each subject.

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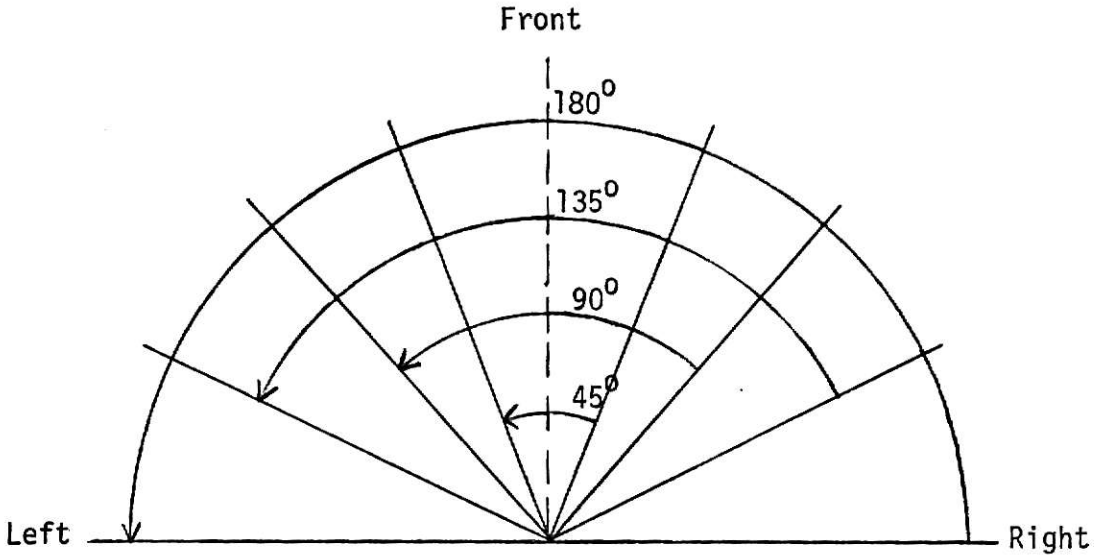

Figure 1. Angles of rotation for experiment.

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Figure 2. Transfer at hip height with 45^{o} angle of rotation and $(15\ cm)^{3}$ volume.

Figure 3. Transfer at knee height with 45^{o} angle of rotation and $(30\ cm)^{3}$ volume.

Figure 4. Transfer at floor height with 90^{o} angle of rotation and $(15\ cm)^{3}$ volume.

Table 1. Characteristics of subjects

Characteristic	Subject 1	2	3	4	5	6	Mean
Age (yr)	26	32	27	39	27	22	28.83
Weight (kg)	65.5	53.5	54	53.4	53.3	61.2	56.82
Height (cm)	177	165	162	163	165	164	166
Maximum oxygen uptake (ML/kg/min)	45.5	39.5	36.5	42	32	33	38.08
Back rotation flexibility (degrees)	83	75	92	62	95	97	84
Trunk flexibility (cm/cm)	.667	.644	.886	.825	.719	.925	.7777
Isometric leg strength (kg)	105	109	95	68	66	102	91.5
Isometric back strength (kg)	85	62	55	60	72	89	70.5
Mean (both hands) grip strength (kg)	28	32.5	30	27.5	33	21.5	28.75
Mean arm push strength (kg)	22	13	27	16.5	19	24	20.25
Body fat (%)	23	18	16	20	18	20	19.2

Once a prospective subject met the first three requirements she went through a physical fitness and health exam. This procedure was done in four steps: 1) health background form, 2) physical fitness test, 3) back x-ray, and 4) physician exam.

A health background form (Coetzee, 1975) was filled out by each prospective subject; see appendix B. If any of the answers were yes, then the prospective subject was screened out. A physical fitness test was given to the remaining prospective subjects. This test included testing of cardiovascular fitness, strength, and flexibility measurements. For a description of the fitness test and minimum allowable requirements (Coetzee, 1975), see appendix C. Six of the remaining prospective subjects were given an AP lateral and two 45^{o} x-rays. The radiologist then evaluated and recorded his findings on the back x-ray report (appendix D). Any prospective subject who had more than two abnormalities of class A or any of class B or C defects was screened out (Coetzee, 1975). If a prospective subject was screened out, another prospective subject went through the x-ray procedure. A physical exam was given to the six prospective subjects by Dr. Gene Klingler. Using the data from the health questionnaire, fitness test, x-rays, and physical exam, Dr. Klingler approved these six prospective subjects for the lifting experiment.

Procedure and experimental design.

Each subject was given details about the experiment and its possible consequences. They were then asked to sign the consent form (appendix E) to participate in this experiment. They were then shown a videotape to familiarize them with the equipment. In addition, it showed them the procedure in which they were to transfer the box, including instructions on

foot position, back position, arm position, and pace. They were then asked if they had any questions. A series of 3 to 5 practice lifts at each of the heights followed. This allowed the subject to familiarize herself with the box, shelf, and force platform, as well as the lifting procedures. The subject then transported four times for each condition (four angles, three heights, and two volumes) in a random order. See appendix F. The subject rated each lift immediately after the lift.

Measurement and instrumentation.

The equipment used in this experiment was a force platform (Hearn and Konz, 1968), see Figure 5; recorders to measure six forces and torques, see Figure 6; two tote boxes, dimensions being $(15\ cm)^3$ and $(30\ cm)^3$; a 5 kg lead weight; and three pairs of stools.

The six forces and torques are lateral force, vertical force, frontal force, somersault torque, cartwheel torque, and twist torque. These forces and torques were relayed by wire from the force platform to the recorders. The recorders recorded the forces and torques for later analysis. The peak forces and torques were gathered from the charts for each subject and each condition. Peak forces and torques were used rather than the averages because no matter how short the time period of occurance, peak stresses still would cause strain on the back muscles.

The subjective evaluation of each lift used the scale of appendix G. A 1 = willing to move object continuously for 8 hrs, a 2 = 1/min for 8 hrs, a 3 = 1/10 min for 8 hrs, a 4 = 1/60 min for 8 hrs, a 5 = 1/120 min for 8 hrs, a 6 = 1/480 min for 8 hrs and a 7 = refuse to do the task.

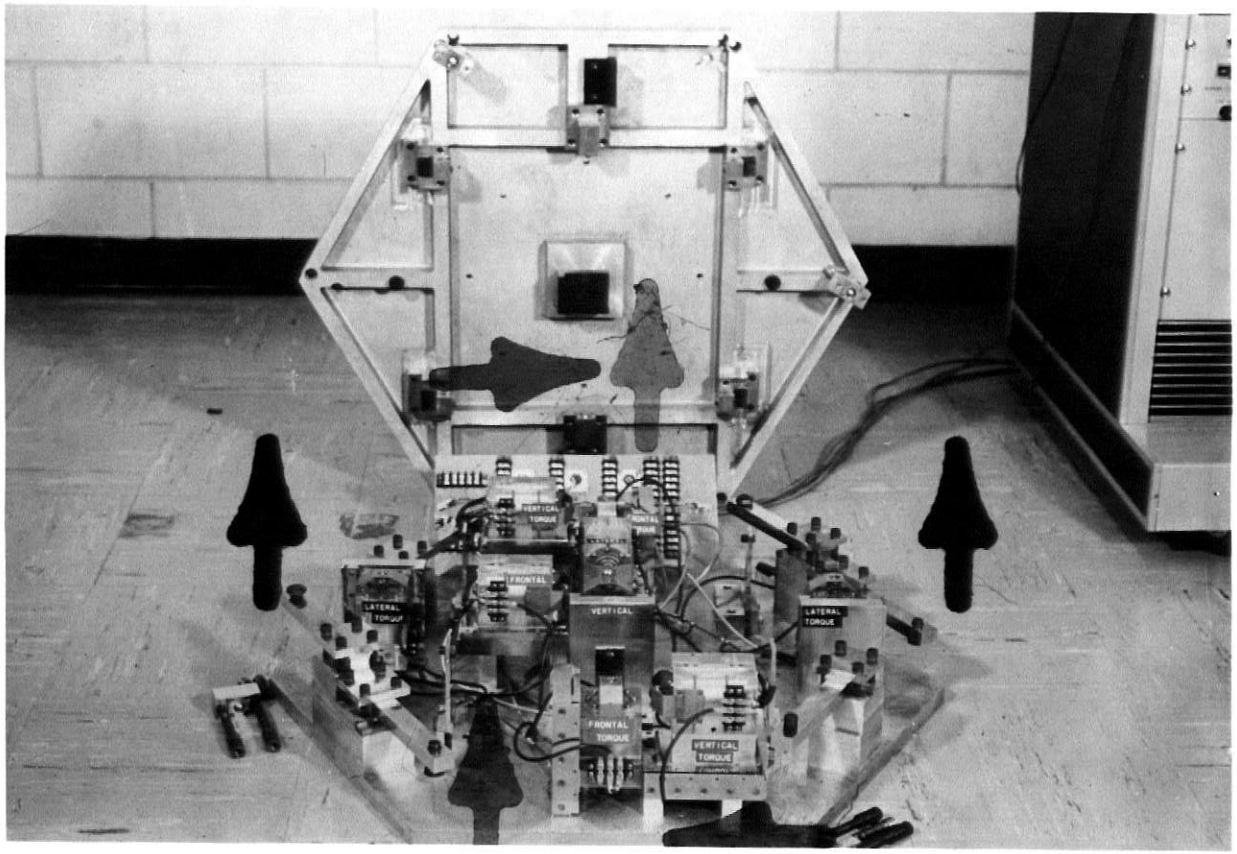

Figure 5. Force platform with top removed.

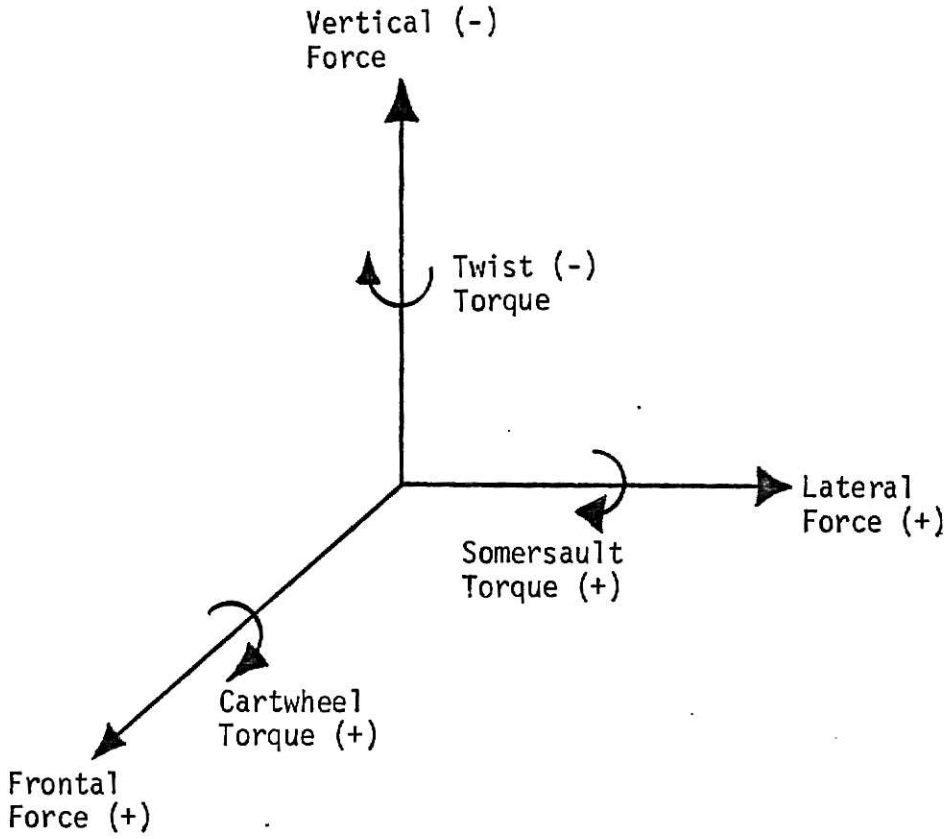

Figure 6. Forces and torques measured by force platform.

RESULTS.

The charts were analyzed to find a typical curve for each of the forces and torques; see Figures 7 and 8. The charts were then analyzed to find the values of the major peaks in millimeter deflections. This data was then key punched on computer cards. The computer then multiplied the appropriate calibration number by each peak value. These values were then stored on a computer disc to simplify later use of data. See appendix H for data listing.

Analysis of variance was used to analyze the data. The level of significance (α) was .05. The Duncan's Multiple Range test was used to analyze the means.

The model used was $Y = S(I) + H(K) + A(J) + V(L) + T(M) + E(IKJLM)$. where

Y = dependent variable

S = Subject	I = 6
H = Height	K = 4
A = Angle	J = 3
V = Volume	L = 2
T = Trial	M = 4
E = Error	

Subjects were significantly different in most cases as was expected. Trials were significantly different in some cases.

The results are summarized in Tables as follows;

1) Lateral force, Tables 2 and 3
2) Vertical force, Tables 4, 5 and 6
3) Frontal force, Tables 7 and 8

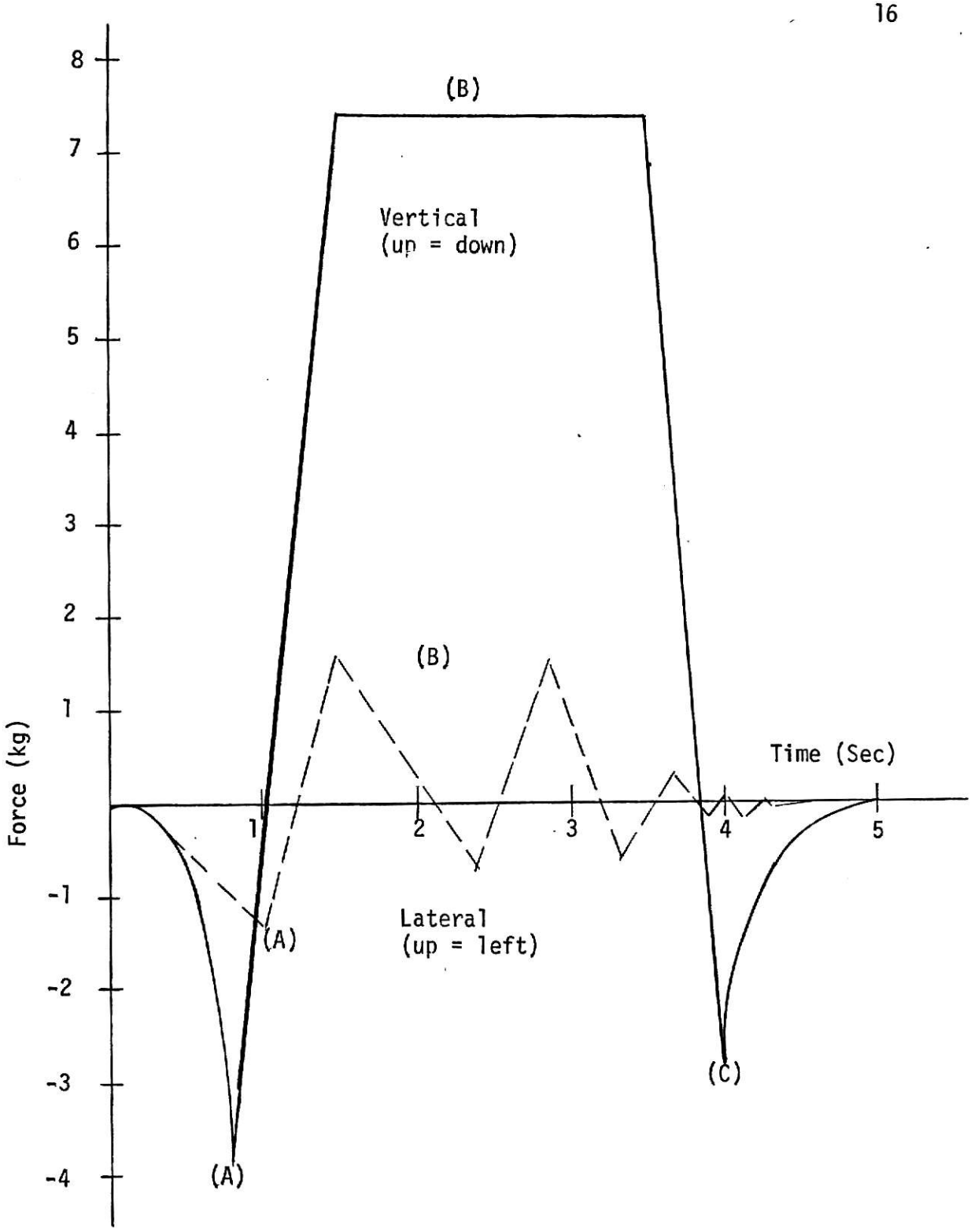

Figure 7. Typical curves for vertical and lateral forces. Frontal force had no definite pattern; its peak A was the largest peak above the axis, peak B the largest peak below the axis (up = back).

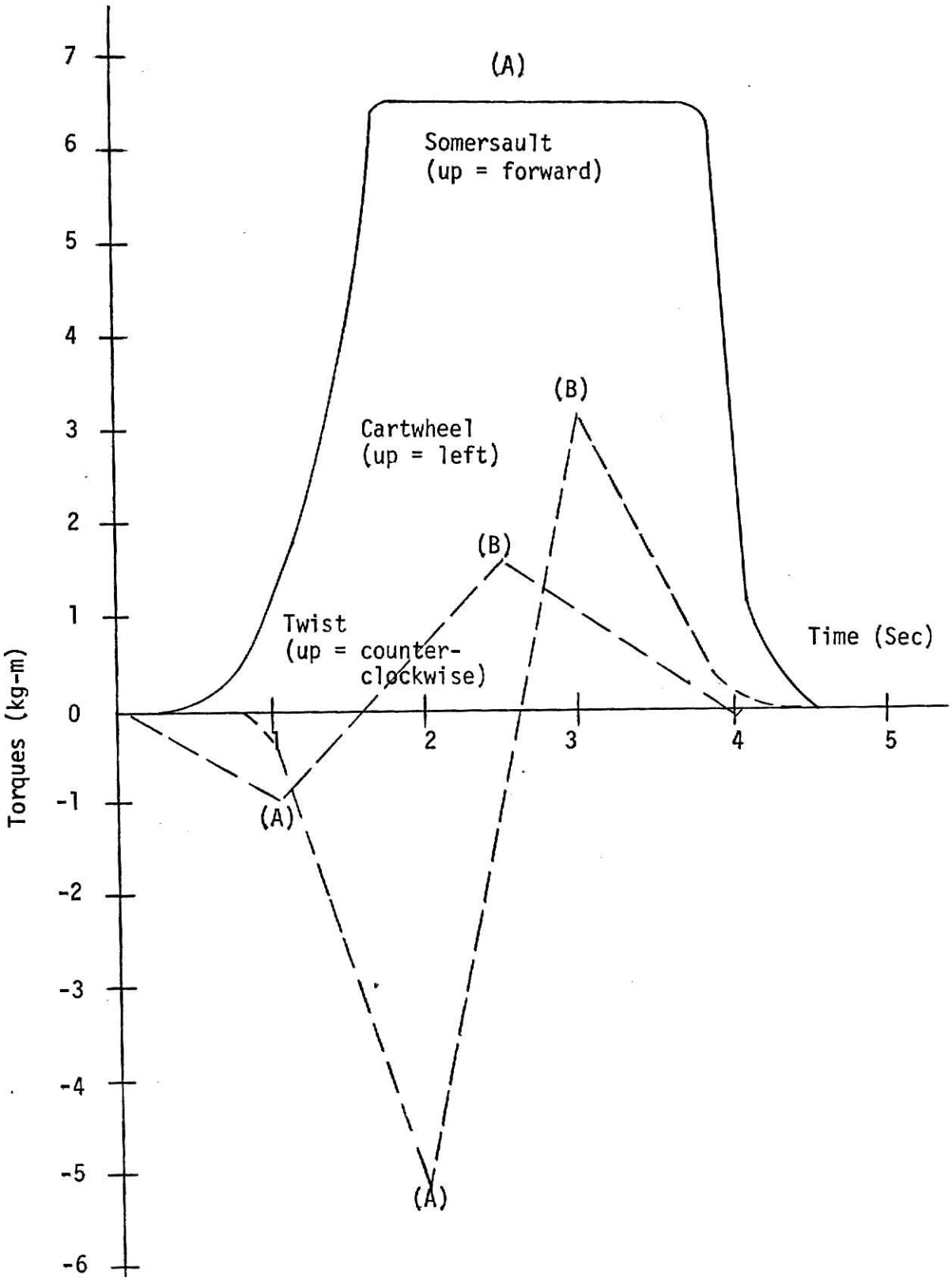

Figure 8. Typical curves for somersault, cartwheel and twist torques.

4) Somersault torque, Table 9

5) Cartwheel torque, Tables 10 and 11

6) Twist torque, Table 12

7) Vote, Table 13

Forces.

Figures 9, 10 and 11 show the overall picture of the forces with respect to height, angle and volume.

Lateral Force. For this force two peaks were analyzed; A and B.

For peak A, Table 2 shows that there is a significant difference in all heights and volumes but a difference for only some angles. The floor height gave the largest force, then knee and hip. The $(30\ cm)^3$ gave the largest force for volume. Forces for angles 135^o and 90^o were not significantly different but were larger than 180^o and 45^o, which were not significantly different.

For peak B, Table 3 shows that there is a significant difference in all heights and angles, but no difference in volumes. For height, the floor height gave the largest forces, then hip and knee. For angle, 180^o gave the largest force, then 135^o, 90^o, and 45^o.

Vertical Force. Three vertical peaks were analyzed; A, B and C.

For peak A, Table 4 shows a significant difference in all heights, but no difference in volumes and a difference for only some angles. For height, floor height gave the largest force, then knee and hip. For angle, forces for 45^o, 135^o, and 90^o were not significantly different but were larger than 180^o. Forces for 135^o, 90^o and 180^o were not significantly different but were smaller than 45^o.

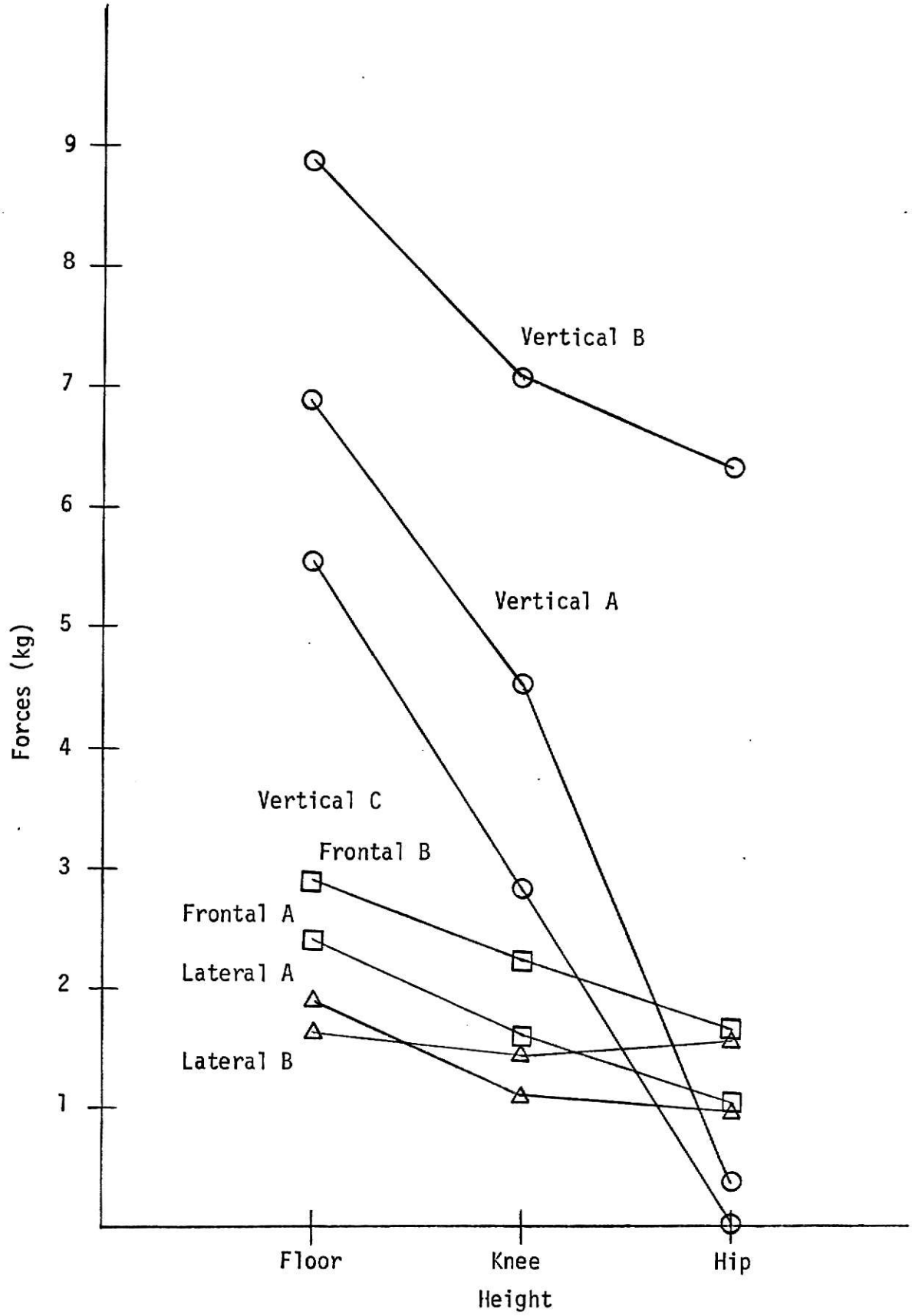

Figure 9. Height had a significant effect on all forces.

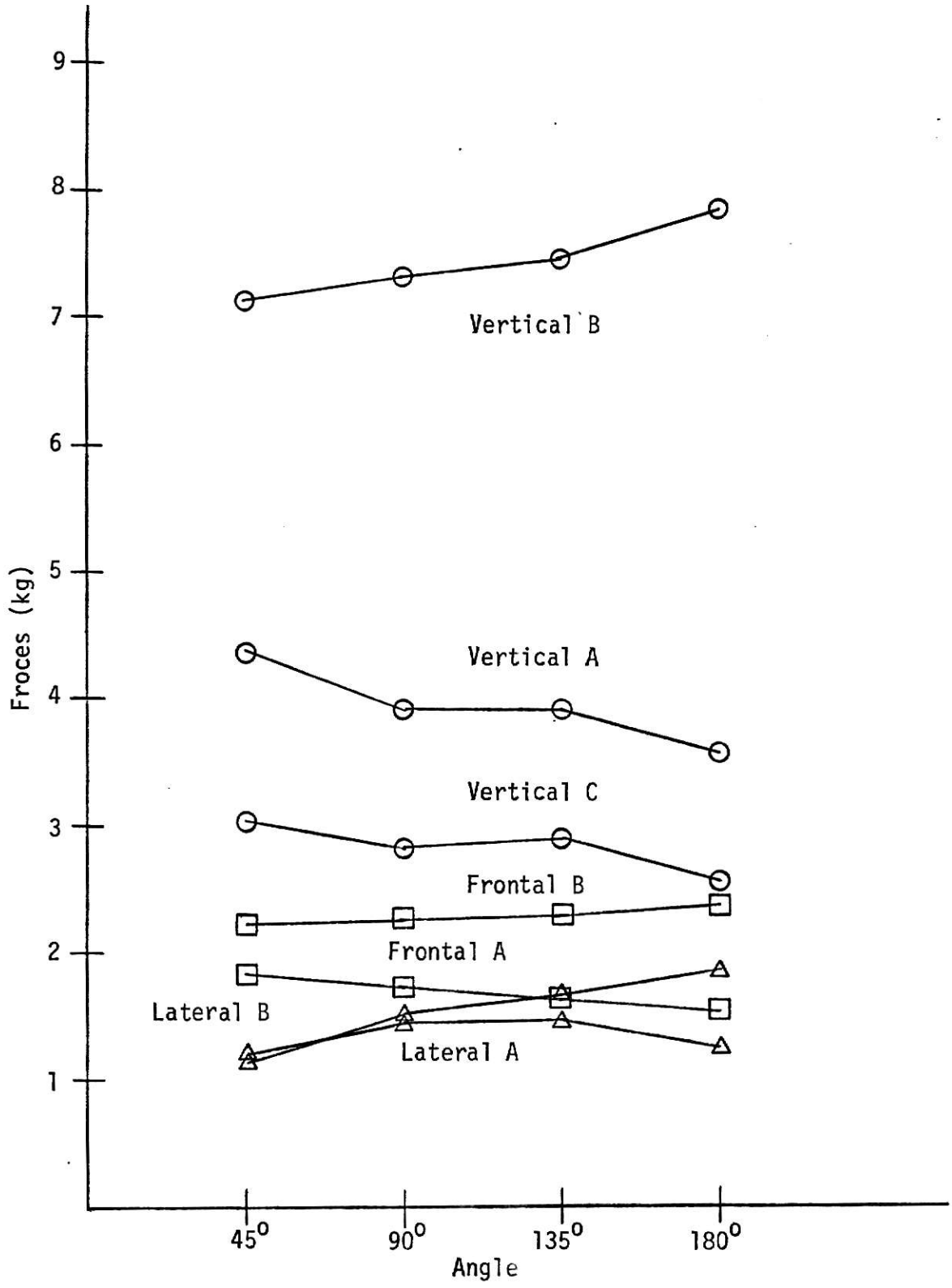

Figure 10. Angle had a significant effect on all forces except vertical C and frontal B.

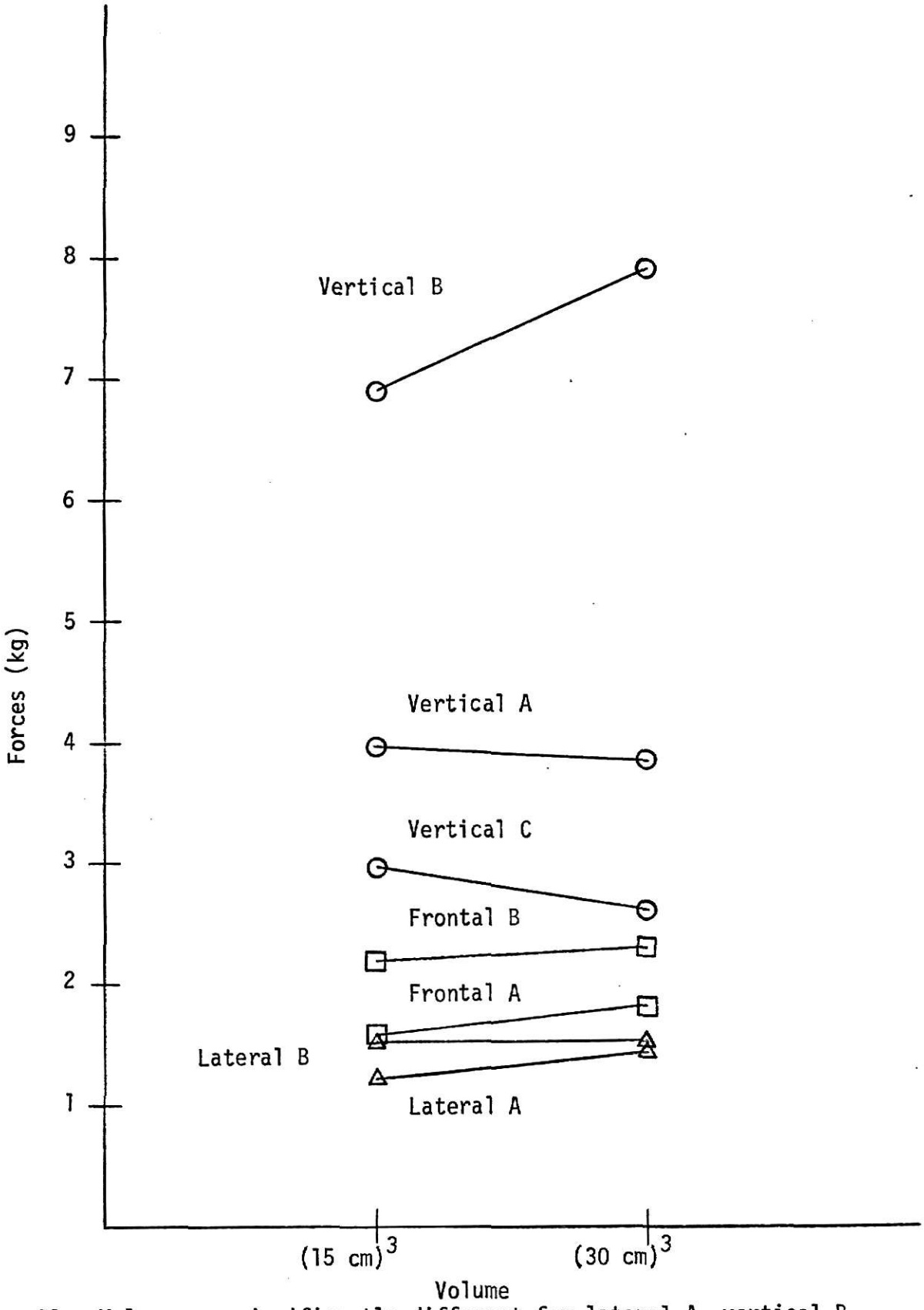

Figure 11. Volume was significantly different for lateral A, vertical B, and frontal A.

Table 2. Comparison of conditions for lateral force (peak A) (kg)

Height			
	Floor	1.87	
	Knee	1.15	
	Hip	.97	
Angle			
	135^{o}	1.45	*
	90^{o}	1.44	*
	180^{o}	1.25	*
	45^{o}	1.19	*
Volume			
	$(30\ cm)^3$	1.42	
	$(15\ cm)^3$	1.24	

* Non-significant groupings connected by columns of asterisks ($\alpha = .05$)

Table 3. Comparison of conditions for lateral force (peak B) (kg)

Height		
	Floor	1.64
	Hip	1.54
	Knee	1.43
Angle		
	180^{o}	1.84
	135^{o}	1.64
	90^{o}	1.50
	45^{o}	1.16
Volume		
	$(30\ cm)^3$	1.53 *
	$(15\ cm)^3$	1.53 *

* Non-significant groupings connected by columns of asterisks ($\alpha = .05$)

Table 4. Comparison of conditions for vertical force (peak A) (kg)

Height			
	Floor	6.88	
	Knee	4.53	
	Hip	0.37	
Angle			
	45^{o}	4.34	*
	135^{o}	3.92	* *
	90^{o}	3.88	* *
	180^{o}	3.57	*
Volume			
	$(15\ cm)^3$	3.99	*
	$(30\ cm)^3$	3.86	*

* Non-significant groupings connected by columns of asterisks ($\alpha = .05$)

For peak B, Table 5 shows a significant difference in all heights and volumes but a difference for only some angles. For height, the floor height gave the largest force, then knee and hip. For volume, the $(30\ cm)^3$ volume gave the largest force. For angle, forces for 180^0 and 135^0 were not significantly different but were larger than 90^0 and 45^0. Forces for 135^0, 90^0 and 45^0 were not significantly different but were smaller than 180^0.

For peak C, Table 6 shows a significant difference for all heights but no difference in angles and volumes. For height, the floor gave the largest force, then knee and hip.

Frontal force. Two peaks were analyzed; A and B.

For peak A, Table 7 shows a significant difference in all heights and volumes, but a difference for only some angles. For height, the floor height gave the largest force, then knee and hip. For volume, the $(30\ cm)^3$ gave the largest force. For angle, 45^0 and 90^0 were not significantly different but were lower than for 135^0 and 180^0; 90^0 and 135^0 were not significantly different but were lower than 45^0 and higher than 180^0.

For peak B, Table 8 shows a significant difference for all heights but no difference in angles and volumes. For height, the floor height gave the largest force, then knee and hip.

Torques.

Figures 12, 13, and 14 show the overall picture of the torques with respect to height, angle, and volume.

Somersault torque. Table 9 shows a significant difference in all heights and volumes but a difference for only some angles. For height, the floor height gave the largest torque, then knee and hip. For volume, the $(30\ cm)^3$ gave the largest torque. For angle, 45^0 had the largest

Table 5. Comparison of conditions for vertical force (peak B) (kg)

Height			
	Floor	8.85	
	Knee	7.06	
	Hip	6.34	
Angle			
	180^{o}	7.82	*
	135^{o}	7.45	* *
	90^{o}	7.28	*
	45^{o}	7.12	*
Volume			
	$(30\ cm)^3$	7.92	
	$(15\ cm)^3$	6.92	

* Non-significant groupings connected by columns of asterisks ($\alpha = .05$)

Table 6. Comparison of conditions for vertical force (peak C) (kg)

Height		
	Floor	5.55
	Knee	2.83
	Hip	0.01
Angle		
	45^{o}	3.01 *
	135^{o}	2.84 *
	90^{o}	2.79 *
	180^{o}	2.55 *
Volume		
	$(15\ cm)^3$	2.98 *
	$(30\ cm)^3$	2.62 *

* Non-significant groupings connected by columns of asterisks ($\alpha = .05$)

Table 7. Comparison of conditions for frontal force (peak A) (kg)

Height			
	Floor	2.42	
	Knee	1.61	
	Hip	1.04	
Angle			
	45^{o}	1.82	*
	90^{o}	1.73	* *
	135^{o}	1.67	*
	180^{o}	1.55	
Volume			
	$(30\ cm)^3$	1.81	
	$(15\ cm)^3$	1.57	

* Non-significant groupings connected by columns of asterisks ($\alpha = .05$)

Table 8. Comparison of conditions for frontal force (peak B) (kg)

Height		
	Floor	2.90
	Knee	2.23
	Hip	1.69
Angle		
	180^{o}	2.35 *
	135^{o}	2.26 *
	90^{o}	2.25 *
	45^{o}	2.23 *
Volume		
	$(30\ cm)^3$	2.32 *
	$(15\ cm)^3$	2.23 *

* Non-significant groupings connected by columns of asterisks ($\alpha = .05$)

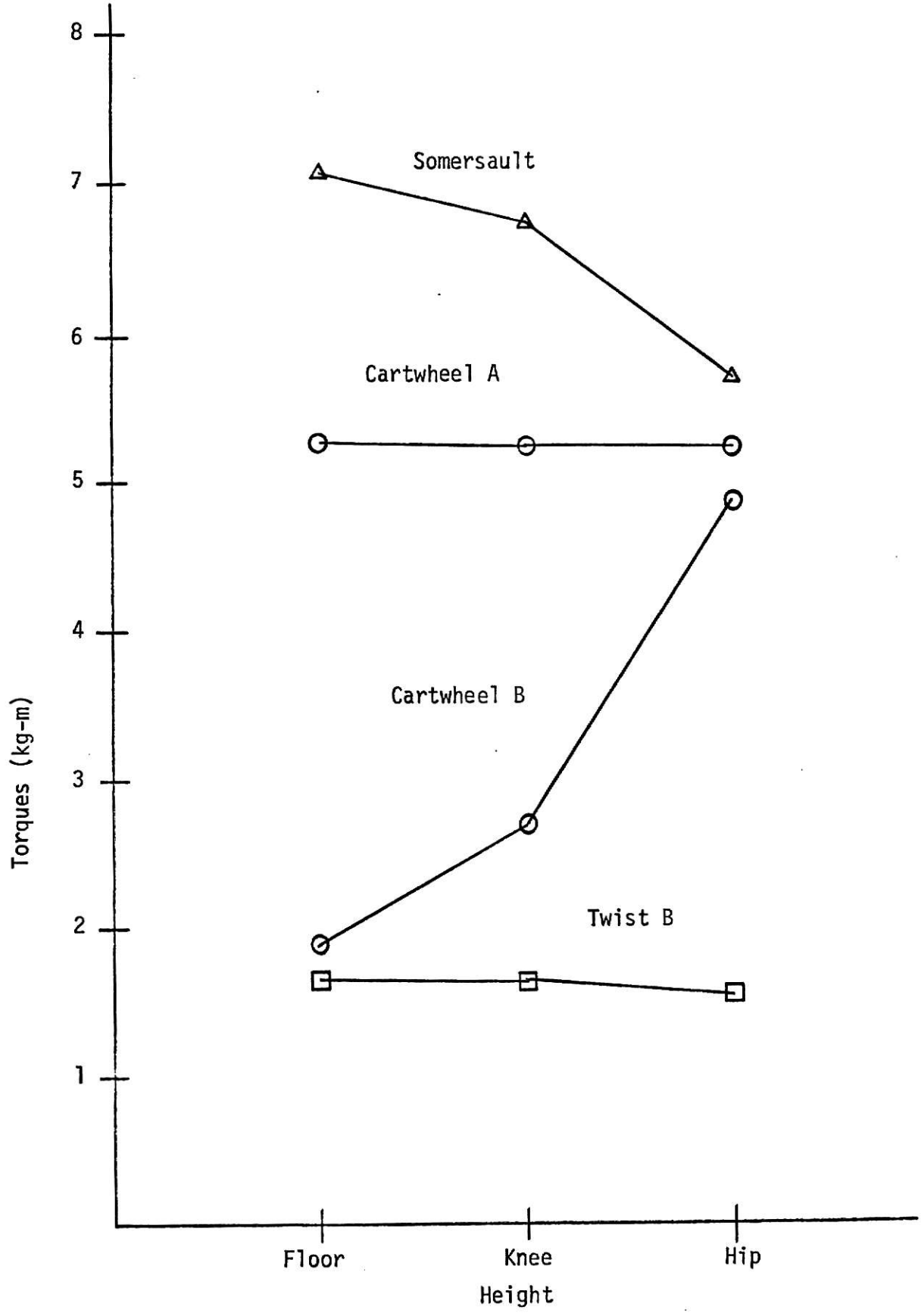

Figure 12. Height had a significant effect on all torques except cartwheel A.

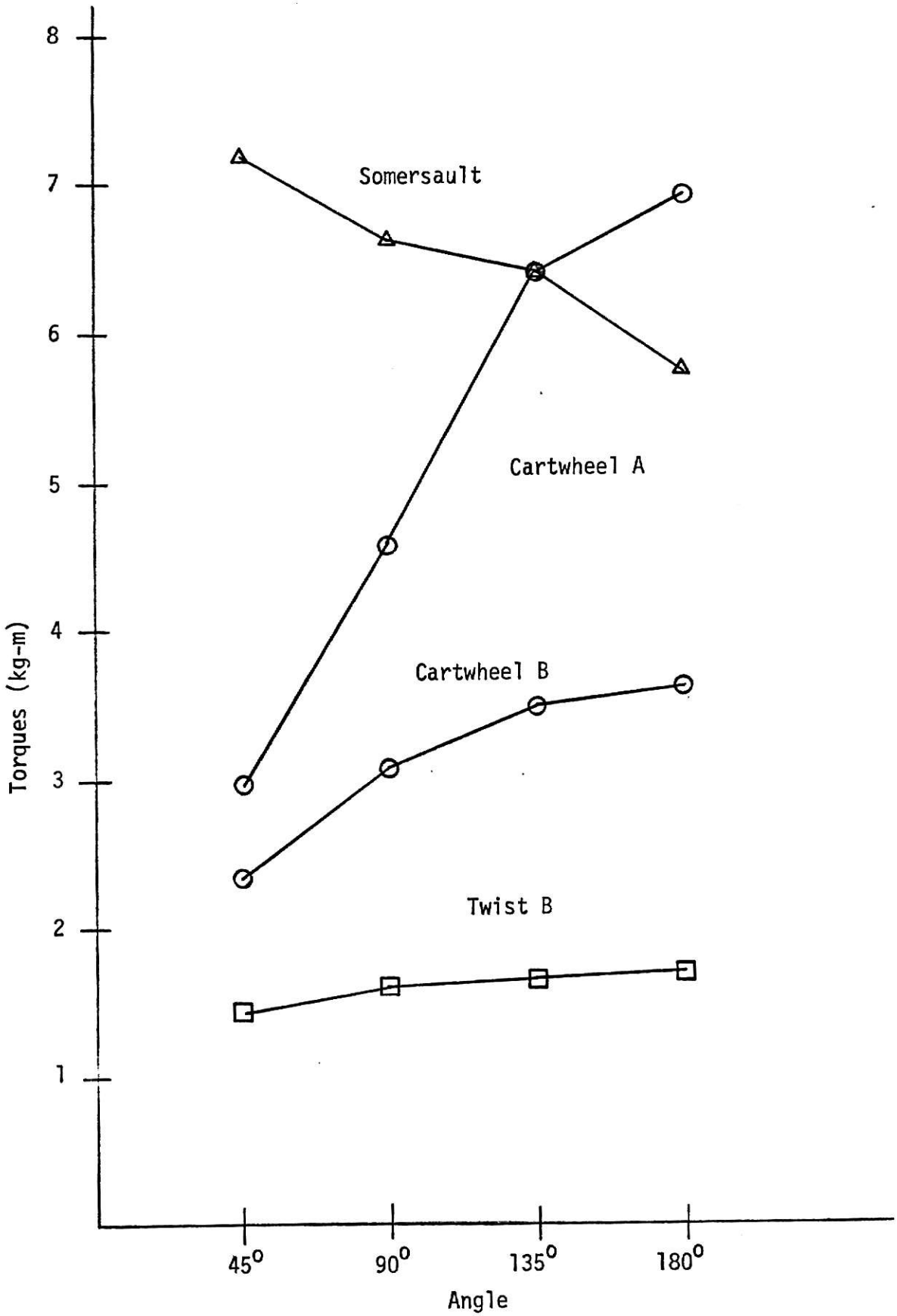

Figure 13. Angle had a significant effect on all torques.

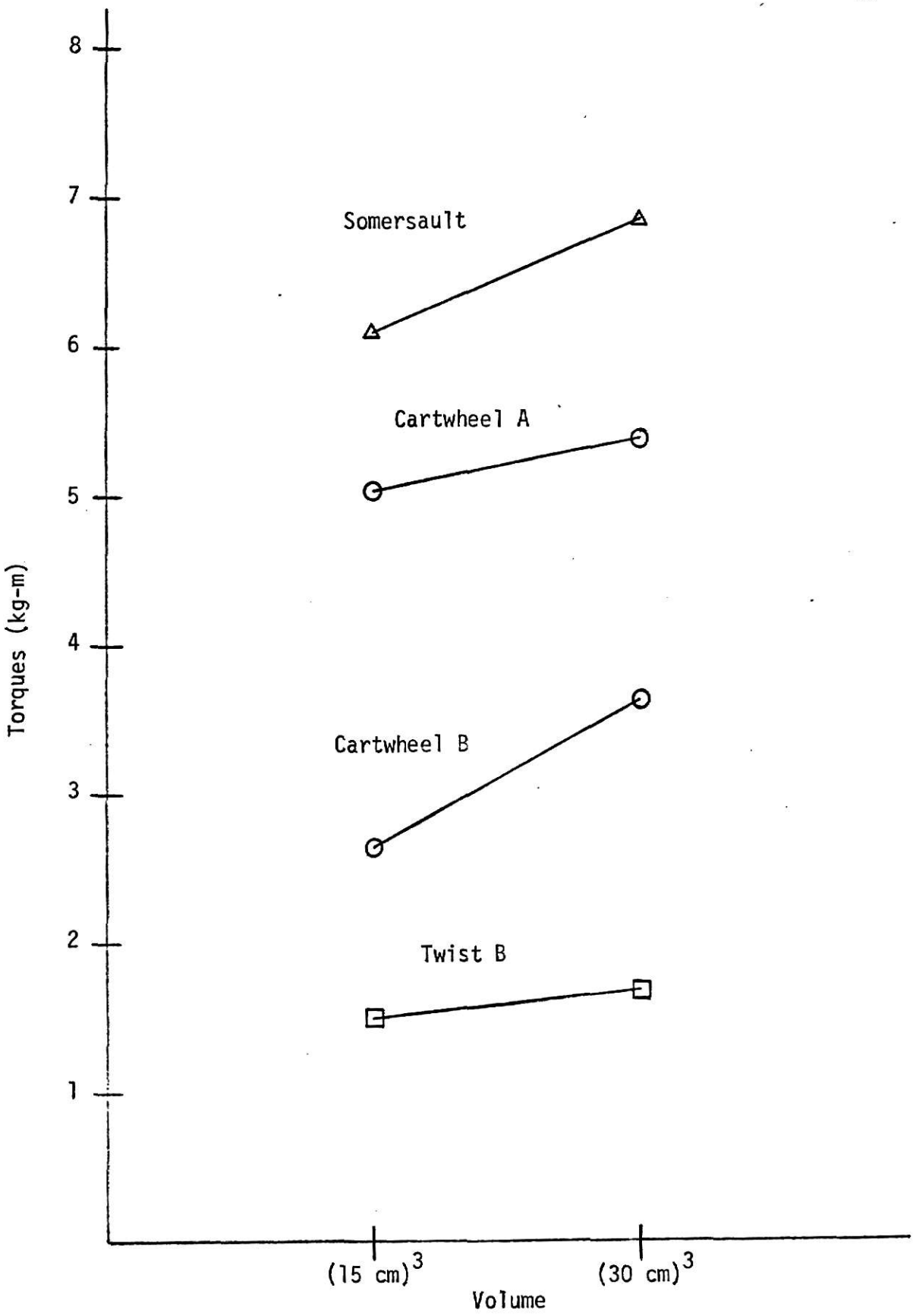

Figure 14. Volume had a significant effect on all torques.

Table 9. Comparison of conditions for somersault torque (kg-m)

Height		
	Floor	7.07
	Knee	6.74
	Hip	5.69
Angle		
	45^{o}	7.20
	90^{o}	6.63 *
	135^{o}	6.41 *
	180^{o}	5.76
Volume		
	$(30\ cm)^3$	6.88
	$(15\ cm)^3$	6.12

* Non-significant groupings connected by columns of asterisks ($\alpha = .05$)

torque, then 90^{o} and 135^{o}, which were not significantly different but were larger than 180^{o}.

Cartwheel torque. Two peaks were analyzed; A and B.

For peak A, Table 10 shows a significant difference in all angles and volumes, but no difference in heights. For angle, 180^{o} had the largest torque, then 135^{o}, 90^{o}, and 45^{o}. For volume, the $(30\ cm)^{3}$ gave the largest torque.

For peak B, Table 11 shows a significant difference in all heights and volumes but a difference for only some angles. For height, the hip height gave the largest torque, then knee and floor. For volume, the $(30\ cm)^{3}$ gave the largest torque. For angle, 180^{o} and 135^{o} were not significantly different but were larger than 90^{o} and 45^{o}.

Twist torque. Table 12 shows a signficant difference in volumes but a difference in only some of the heights and angles. For volume, the $(30\ cm)^{3}$ volume gave the largest torque. For height, the floor and knee height torques were not significantly different but were larger than hip height. The knee and hip height torques were not significantly different but were smaller than floor height. For angle, 135^{o} and 180^{o} were not significantly different but were larger than 90^{o} and 45^{o}. The torques for 180^{o} and 90^{o} were not significantly different but were smaller than 135^{o} and larger than 45^{o}.

Vote.

Figures 15, 16 and 17 show the overall picture of the vote with respect to height, angle, and volume (low = preferred). Appendix G has the scale.

Table 13 shows that there is a significant difference in votes for all heights, angles, and volumes. For height the floor height gave the largest

Table 10. Comparison of conditions for cartwheel torque (peak A) (kg-m)

Height		
	Floor	5.26 *
	Hip	5.23 *
	Knee	5.22 *
Angle		
	180^{0}	6.94
	135^{0}	6.42
	90^{0}	5.59
	45^{0}	2.99
Volume		
	$(30\ cm)^{3}$	5.40
	$(15\ cm)^{3}$	5.07

* Non-significant groupings connected by columns of asterisks ($\alpha = .05$)

Table 11. Comparison of conditions for cartwheel torque (peak B) (kg-m)

Height		
	Hip	4.86
	Knee	2.70
	Floor	1.88
Angle		
	180^{o}	3.65 *
	135^{o}	3.49 *
	90^{o}	3.10
	45^{o}	2.36
Volume		
	$(30\ cm)^3$	3.65
	$(15\ cm)^3$	2.65

* Non-significant groupings connected by columns of asterisks ($\alpha = .05$)

Table 12. Comparison of conditions for twist torque (peak B) (kg-m)

Height			
	Floor	1.64	*
	Knee	1.61	* *
	Hip	1.57	*
Angle			
	135^{o}	1.69	*
	180^{o}	1.66	* *
	90^{o}	1.61	*
	45^{o}	1.45	
Volume			
	$(30\ cm)^3$	1.70	
	$(15\ cm)^3$	1.50	

* Non-significant groupings connected by columns of asterisks ($\alpha = .05$)

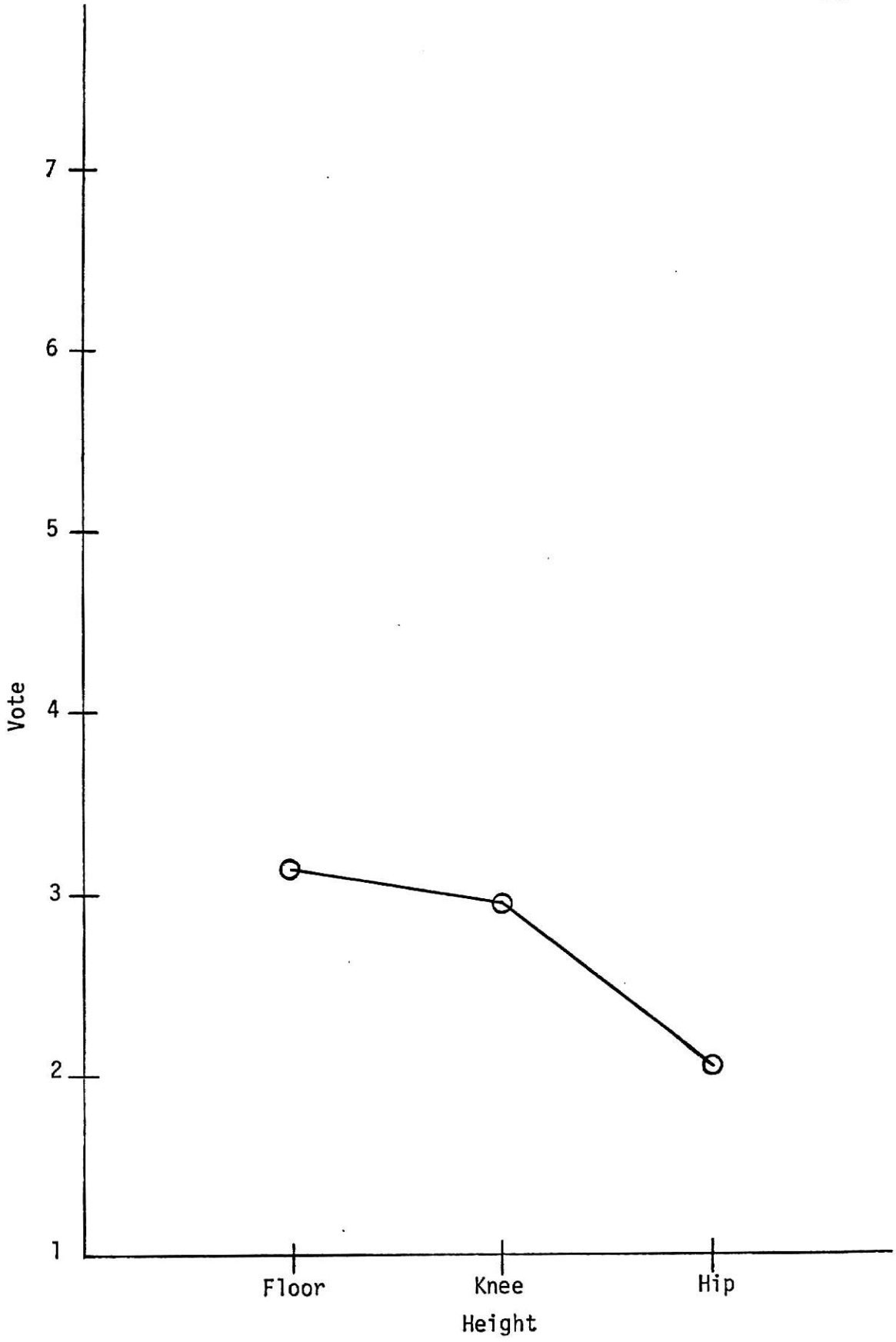

Figure 15. Vote decreased as height increased.

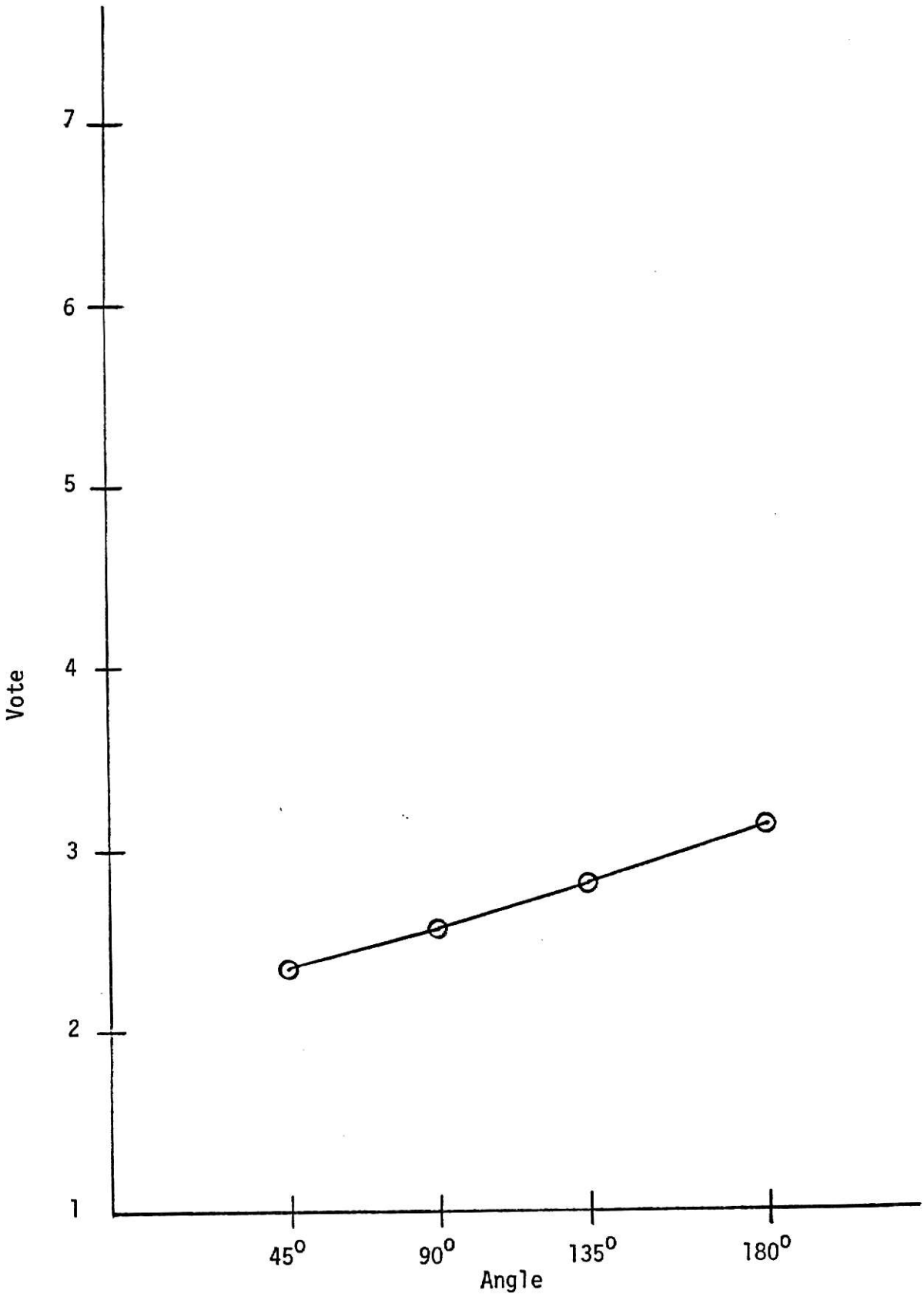

Figure 16. Vote increased as angle increased.

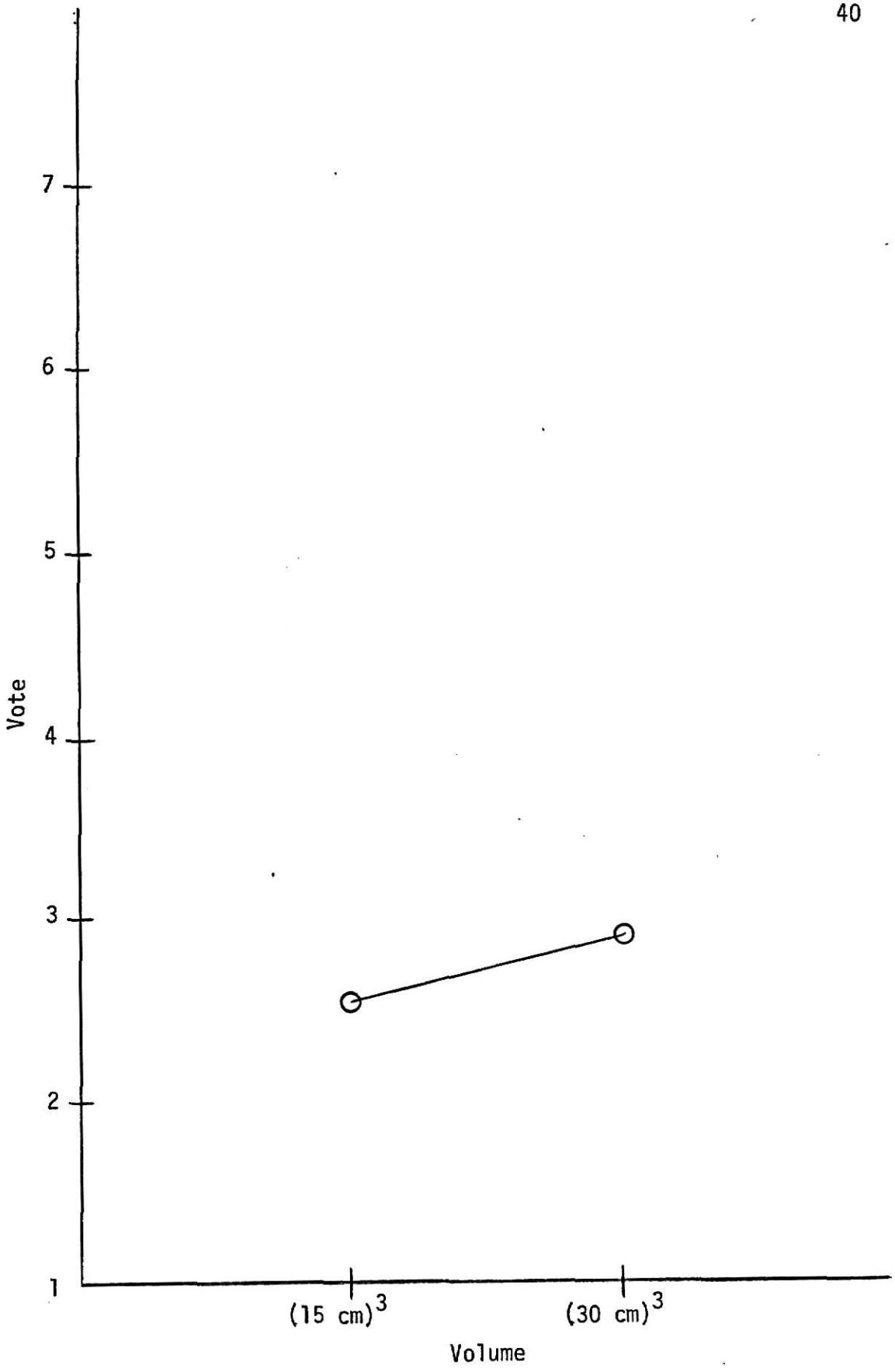

Figure 17. Vote increased as volume increased.

Table 13. Comparison of conditions for vote (low vote = preferred)

Height		
	Floor	3.16
	Knee	2.96
	Hip	2.03
Angle		
	180^{o}	3.14
	135^{o}	2.82
	90^{o}	2.55
	45^{o}	2.35
Volume		
	$(30\ cm)^3$	2.90
	$(15\ cm)^3$	2.53

* Non-significant groupings connected by columns of asterisks ($\alpha = .05$)

vote, then knee and hip. For angle, 180^{o} had the largest vote, then 135^{o}, 90^{o} and 45^{o}. For volume, the $(30\ cm)^{3}$ volume had the largest vote.

DISCUSSION.

Lateral force.

As height increased the reason for the overall decreasing trend is that the lower heights put the body in an awkward position causing a larger lateral force. As the angle increased the lateral force increased because the grasp and release of the box was closer to the lateral axis. As volume increased the reason for the increase in lateral force is that the subject was in more of an awkward position for the large object.

Vertical force.

As height increased the definite downward trend was due to the body being moved for the lower heights. For different angles the reason for little difference in the values of peak A and C is that these peaks deal with the acceleration and de-acceleration of the body in the vertical plane. In contrast, peak B increases as angle increases because it deals with the force applied downward, which increases as the angle increases. As volume increased the vertical force increased because the subject was in a more awkward position for the large object causing a larger force.

Frontal force.

As height increased the reason for the decrease in frontal force was that the lower the height the more awkward a position causing a larger force. As the angle increased, the force decreased because the grasp and release of the object was closer to the frontal axis. As volume increased the reason for the increase in frontal force was that the larger volume causes the subject to be in more of an awkward position.

Somersault torque.

As the height increased the reason for the decrease in somersault torque was that the leading foot causes larger torques due to the awkward

position at the lower heights. As the angle increased the somersault torque decreased because the grasp and release at the smaller angles are closer to the somersault axis thus causing larger somersault torques. As volume increased the reason for the increase in torque was that the bigger the volume the farther out the load will be thus causing a larger torque.

Cartwheel torque.

As height increased cartwheel torque increased because the higher the lift the longer the moment arm would be thus causing a larger torque. As angle increased the reason for the increase in cartwheel torque was that the larger angles are closer to the grasp and release which are closer to the cartwheel axis. As volume increased the cartwheel torque increased because the larger the volume the farther out the load will be thus causing a larger torque.

Twist torque.

Height did not affect twist torque very much because the twist torque is a measure of rotation in the horizontal plane and thus is not affected by height. As the angle increased the reason for the increase in torque is that the larger the angle the farther you have to twist, thus increasing the torque. The increased volume caused an increased twist torque because the larger the volume the farther out the load will be, thus causing a larger torque.

Vote.

Vote went up as the difficulty of the task went up. For example, vote for floor height was higher than hip height, 180^{o} was higher than 45^{o}, and $(30\ cm)^{3}$ was higher than $(15\ cm)^{3}$.

CONCLUSIONS.

Forces, torques and subject vote were measured for three heights (floor, knee, and hip), four angles (45^{o}, 90^{o}, 135^{o}, and 180^{o}), and two volumes ($(15\ cm)^3$ and $(30\ cm)^3$) to gain insight on what happens to them during a horizontal movement of a 5 kg (11 lb) box.

Lateral force.

Overall, lateral force decreased as height increased, but increased as angle and volume increased. Mean peak lateral force (1.5 kg to the left) occurred during the move.

Vertical force.

Vertical force decreased as height increased, but increased as angle and volume increased. Mean peak vertical (7.4 kg downward) occurred during the move.

Frontal force.

Frontal force decreased as height and angle increased, but increased as volume increased. Mean peak frontal force (2.3 kg forward) occurred during the move.

Somersault torque.

Somersault torque decreased as height and angle increased, but increased as the volume increased. Mean peak somersault torque (6.5 kg-m forward) occurred during the move.

Cartwheel torque.

Cartwheel torque increased as height, angle and volume increased. Mean peak cartwheel torque (5.3 kg-m right) occurred during the grasp.

Twist torque.

Twist torque decreased slightly as height increased but increased as angle and volume increased. Mean peak twist torque (1.6 kg-m counter-clockwise) occurred during the move.

Vote.

Vote (low = preferred) decreased as height increased but increased as angle and volume increased. Mean vote was 2.7.

The most important design decision is to avoid horizontal transfers below the knees; there is only a small difference between knee and hip height transfers. A smaller angle of rotation and more compact loads also are preferred.

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APPENDIX A

APPLICATION FOR APPROVAL TO USE HUMAN SUBJECTS

1. PROJECT TITLE: Moving Weights at the Same Height--
Effect of Height, Angle of Movement and Object Volume

2. PROPOSED SPONSOR: Department of Industrial Engineering

3. PERSONNEL INVOLVED:

NAME	DEPARTMENT	PHONE
Stephan A. Konz	Industrial Engineering	532-5606
Thomas E. Parker	Industrial Engineering	532-5606

4. ATTACHED IS A COPY OF THE PROJECT PROPOSAL

The subject screening is very similar to Coetzee's which was approved in October 1975.

A. RISK. There are two types of physical possible risks associated with the subjects involved in the experiment: strain of the cardiovascular system and of the skeleto-muscular systems. To minimize the possibility of injury the subjects will have to pass all of the four different screening tests:

1. Each subject will complete a health background questionnaire (see appendix B). Any positive answers on this questionnaire will disqualify that subject.

2. Each subject will be given a physical fitness test which is given in conjunction with the Health Physical Education and Recreation Department of Kansas State University under supervision of Dr. William Zuti. For description of test see appendix C. This test will stress the cardiovascular

system, muscular strength, and muscle flexibility. The minimum allowable ratings are given in appendix C1.

3. Each subject will be given a routine roentgenogram. The radiologist will then evaluate the x-rays and record data on x-ray report form (appendix D). Any subject with more than two Class A or any Class B or C abnormalities will be screened out.

4. Each subject will be given a physical examination by Dr. Gene Klingler. With the data collected from three previous steps and the results of physical examination the physician will then approve the subjects' qualification to participate in this experiment. While there exists a risk involved in the using of human subjects in any experimental procedure, it is believed that the screening process described above will minimize this risk.

B. INFORMED CONSENT. Procedure is discussed on page 11 of the proposal. Once the subject is qualified to participate she will be given instructions and briefing about the experiment. Included will be the possible injuries associated with the experiment. She will then sign the consent form (See appendix E of proposal).

C. EMERGENCIES. Possible injuries that could arise are:

1. Cardiovascular strain.
2. Skeleto-muscular strain.
3. Injury due to dropping the object that is being moved.

Due to the screening process used, we avoid some of the risk associated with the cardiovascular and skeleto-muscular strain. In addition there will be a rest period of 60 seconds between consecutive conditions and 20 seconds between the two consecutive trials to avoid fatigue. The weight of the object will not exceed 10 kg which will reduce skeleto-muscular strain. This weight is well within International Labor Office limits of 55 kg. In previous experiments the dropping of objects has not been a problem.

A lead weight will be put inside the box which has a lid and safety lock on it. This is to avoid an accident due to the lead weight falling out of the box.

If an emergency did arise, although it is very unlikely, the following facilities can be used depending on the severity of the emergency.

1. Student Health (100 meters from Human Factors Laboratory).
2. Ambulance from the Memorial Hospital (3 minutes).
3. First aid kit in Human Factors Laboratory.
4. Telephone (approximately 3 meters from experiment).

D. PRIVACY. For any subject that is screened, the questionnaires and test reports will be destroyed or returned to the subject. The subject involved in the experiment will be given a number on a random basis, which will be her only identification on the experiment. On completion of the research all documents containing private information will be destroyed, although all pertinent information will be in posession of the Department of Industrial Engineering in a coded form.

5. STATEMENT OF AGREEMENT. The below named individual certifies that he has and is willing to conduct the activities in accordance with the Handbook for Research Development, Demonstration, or other Activities Involving Human Subjects. Further, the below named individual certifies that any change in the procedure from these outlined above or in the attached proposal will be cleared through Committee 5075, The Committee on Research Involving Human Subjects.

Signed _____ Date _____
The Responsible Individual

KANSAS STATE UNIVERSITY

Graduate School
Fairchild Hall
Manhattan, Kansas 66506
Phone: 913 532-6191

January 16, 1976

TO: Prof. Stephen Konz
Department of Industrial Engineering
Seaton Hall

FROM: John P. Murry, Chairperson
Committee on Research Involving Human Subjects

RE: Committee Review of Your Proposal Titled "Moving Weights at the Same Height--Effect of Height, Angle of Movement and Object Volume"

The Committee on Research Involving Human Subjects has reviewed the proposal identified above and has approved it with the stipulations indicated below.

This approval applies for this project only and only under the conditions and procedures described in the application. Any change in the protocol or conditions described in the proposal will require separate approval. This approval will be followed by surveillance procedures which will require periodic review of the project by consultation with the Responsible Individual and the examination of the appropriate records of the activity. Individual identification of human subjects in any publication is an "invasion of privacy" and requires a separate executed "informed consent."

Prior to initiation of activities involving human subjects, (unless specifically exempted) properly executed informed consent must be obtained from each subject or his/her authorized representative and such forms must be retained on file by the Responsible Individual for a minimum of five years after termination of the project.

Any unanticipated problems involving risk to human subjects or others should be reported immediately to the Director of the Student Health Center.

Stipulations: 1. The "informed consent" page should explain the type of inquiry which the subject might incur by participating in the project. The subject must be better informed of the dangers when providing their written consent. A revised "consent form" must be filed with the Committee.

SURGICAL ASSOCIATES, P.A.
GEORGE S. BASCOM, M. D.
EUGENE A. KLINGLER, M. D.

MANHATTAN MEDICAL CENTER
PHONE 913-539-5341

1133 COLLEGE AVENUE
MANHATTAN, KANSAS 66502

February 3, 1976

Dr. Tom Parker
Industrial Engineering Dept.
Kansas State University
Manhattan, Kansas 66506

Re: Cheryl Kaufman
Judy O'Brien

Dear Tom:

This is to confirm that the above named people were in for back examinations and we feel they are able to participate in your program.

Sincerely yours,

Gene Klingler

E. A. Klingler, M.D.

EAK:sje

ILLEGIBLE DOCUMENT

THE FOLLOWING DOCUMENT(S) IS OF POOR LEGIBILITY IN THE ORIGINAL

THIS IS THE BEST COPY AVAILABLE

SURGICAL ASSOCIATES, P.A
GEORGE S. BASCOM, M. D.
EUGENE A. KLINGLER, M. D.

MANHATTAN MEDICAL CENTER
PHONE 913 539 5341

1131 COLLEGE AVENUE
MANHATTAN, KANSAS 66502

November 7, 1975

Dr. Frank A. Tillman
Industrial Engineering
Kansas State University
Manhattan, Kansas 66506

Dear Dr. Tillman:

This is to certify that the following people were examined by us and found to be grossly free of any back or lower neurological problems.

Lanna Coetzee
Peter Conner
Barbara Conner
Helen McIlvain
Sonie Liebler
Douglas DeMahy
Sam Maurer
Bruce Friederick
Steve Baxley
Caron Cook
Dan Deter
Catherine Deter

Sincerely yours,

E. A. Klingler, M.D.

EAK:sje

APPENDIX B

HEALTH BACKGROUND FORM

Name _____ Age _____ Date _____

Address _____ Occupation _____

_____ Body weight_____(lb)

_____ Phone _____ Height _____(in.)

(Please check correct answers. If any of the answers is "yes", please explain on the back page.)

	YES	NO
1. Have you ever had weight lifting training?	____	____
2. Have you ever been formally instructed for a weight lifting method?	____	____
If yes, do you lift weights according to instructions?	____	____
3. Have you ever had severe pains in the chest:	____	____
4. Has a doctor ever said your blood pressure was too high or too low?	____	____
5. Are you often conscious of heavy beating of your heart?	____	____
6. Does your heart often beat very rapidly?	____	____
7. Do you get out of breath with an ordinary amount of exercise?	____	____
8. Do your hands and feet feel cold even in hot weather?	____	____
9. Has a doctor ever said you had heart trouble?	____	____
10. Do you suffer from frequent painful cramps in your legs?	____	____

		YES	NO
11.	Have your joints ever been painfully swollen?	____	____
12.	Do your muscles and joints always feel stiff?	____	____
13.	Do you usually have severe pains in the arms or legs?	____	____
14.	Are you crippled with severe rheumatism (arthritis)?	____	____
15.	Do you suffer from weak or painful feet?	____	____
16.	Do you have pains in the back that make it hard for you to keep up with your daily activities?	____	____
17.	Are you troubled by a serious bodily disability or deformity?	____	____
18.	Have you ever had a medical problem associated with weight lifting?	____	____
19.	Is your skin usually sensitive or tender?	____	____
20.	Do you have frequent severe headaches?	____	____
21.	Do you frequently feel faint?	____	____
22.	Have you fainted more than twice in your life?	____	____
23.	Was any part of your body ever paralyzed?	____	____
24.	Have you ever noticed a twitching of any part of your body?	____	____
25.	Did you ever have a convulsion (epilepsy)?	____	____
26.	Were you ever treated by a doctor for anemia (thin blood)?	____	____
27.	Have you ever had a serious operation?	____	____
28.	Have you ever had a serious injury?	____	____
29.	Has a doctor ever said you had a hernia (rupture)?	____	____
30.	Do you sweat or tremble a lot during examinations or questioning?	____	____

	YES	NO
31. Do you get nervous and shaky if anyone is watching you?	____	____
32. Does every little effort wear you out?	____	____
33. Do you suffer from severe nervous exhaustion?	____	____
34. Are you considered a sickly person?	____	____

As indicated by my signature below and being of sound mind, I agree that the above questionnaire have been correctly and truthfully completed to the best of my knowledge. I also further understand that all the data contained therein is confidential and I agree to allow publication of any or all of the data in a coded form.

_____ _____

Signature of subject Date

_____ _____

Signature of witness Date

APPENDIX C

PHYSICAL FITNESS TEST

This test was done in conjunction with the Department of Health Physical Education and Recreation at Kansas State University. The purpose of this test was to screen out prospective subjects which did not meet minimum requirements (Coetzee, 1975); see Table C1. This test was made up of three tests, a cardiovascular and respiratory fitness condition, the body's flexibility, and it's strength. The results of each test was put on a fitness sheet, see Fig. C1. Specific care was given to the accuracy of observing different fitness measures.

For the cardiovascular fitness, the "bike-test" (bicycle ergometer) was used. The body flexibility was measured at three points; shoulder, trunk, and back. The body strength was measured for left and right grip strength, leg, back, and arm push strength. The procedure of testing flexibility and isometric strengths are described in Zuti (1975), Poulsen (1970) and Asmussen (1959). The prospective subject repeated each test measure three times. The best of the three values was then taken as the measured flexibility or strength. The subject was then allowed approximately 15 minutes to rest before starting the bicycle test to reduce fatigue prior to the test.

Table C1. Minimum fitness requirements

Sex Fitness test	Female
Cardiovascular	29 ml/kg/min.
Back rotational flexibility (degrees)	60
Trunk flexibility (cm/cm)	.60
Isometric leg muscle strength	Greater than 100% of body weight
Isometric back muscle strength	Greater than 67% of body weight
Mean (both hands) grip strength	20 kg
Mean arm push strengtn	10 kg

FITNESS SHEET

Name _____ Age _____(years) Height _____(cm)

Address _____ Sex _____Weight _____(kg)

_____ Phone _____

Soc. Sec. _____

Date _____ Resting heart rate _____(B/M)

Resting blood pressure _____(B/M)

1. Bike test: KPM _____ HR _____ _____ average

Est. O_2 _____ l. Est O_2 _____ ml/kg/min

2. Flexibility: Back rotation _____, Trunk _____,

3. Strength: Left grip _____, right grip _____(kg), leg _____(kg), back muscle _____(kg), left arm push _____(kg), right arm push _____(kg).

Average grip strength _____(kg)

Average arm push strength _____(kg).

4. Skinfold: Chest _____, Iliac _____, Tricep _____,

Waist girth _____(cm), % Body fat _____, Ideal weight _____.

PERSONAL HISTORY.

What is your past history of exercise?

Recent regular exercise - type _____

Recent occasional exercise - type _____

Current formal exercise _____

Former athlete- sport _____

Figure C1. Fitness testing summary.

APPENDIX D

BACK X-RAY REPORT

Location _____ **Date** _____

Name _____ **Age** _____ **Sex** _____

Height _____ **Weight** _____

Previous History _____

A. ABNORMALITIES OF MINOR IMPORTANCE
(Combination of several may be important)

1. ☐ Mild tropism lumbar joints
2. ☐ Minor spina bifida occulto (X-Ray findings only)
3. ☐ Schmorl's nodes L 1-2-3
4. ☐ Minor cong. defects - no symptoms
5. ☐ Minor lordosis
6. ☐ Osteoarthritis - X-Ray only
7. ☐ Minimal Scoliosis
8. ☐ 6 Lumbar Vertebrae

B. ABNORMALITIES OF INCREASED IMPORTANCE
Questionable Acceptance for Sustained Heavy Work
(Combination of several is significant)

1. ☐ Marked tropism lumbar joints or facets
2. ☐ Extensive spina bifida occulta
3. ☐ Schmorl's nodes L 3-4-5 - & loss lumbar curve
4. ☐ Moderate degenerative changes upper lumbar or lesser in lumbar spine
5. ☐ Mild to moderate scoliosis
6. ☐ Decrease in lumbar segments (5 to 4)
7. ☐ Transitional lumbosacral vertebra & no pseudoarthrosis
8. ☐ Minimal Narrowing L - 5, S - 1 interspace

C. ABNORMALITIES INDICATING SUBSTANDARD RISK FOR SUSTAINED HEAVY WORK

1. ☐ Spondylolysis or sponcylolisthesis
2. ☐ Transitional lumbosacral vertebra with pseudoarthrosis
3. ☐ Narrowing intervertebral space L 3-4-5, especially associated with marginal spurring, sclerosis, etc. Upper lumbar narrowing possibly less significant.
4. ☐ Marked hypertrophic degeneration - upper lumbar,
   Moderate " " L 4-5 and
   Milder " " if under 30 years
5. ☐ Collapsed or wedged vertebra; evidence old fractures of vertebral body or neural arch, or multiple defect of spines or transverse process
6. ☐ Neoplasm or destruction of bone
7. ☐ Extensive spine bifida of 2 or more vertebrae
8. ☐ Prior back surgery; radio-opaque materials evidence previous infections; Marie-Strumpell spondylitis; major congential anomoly, disease of lumbosacral or sacroiliac joints
9. ☐ Active osteomyelitis or substantiatea history of osteomyelitis, or reactive change of sacroiliac in younger persons
10. ☐ Symptomatic osteoarthritis or rheumotoid
11. ☐ Hernicted nucleus pulposus, or history of surgery re.
12. ☐ Disease of sacroiliac or lumbosocral joints, chronic with radiated pain; postural deformities and/or limitation of motion, lumbar
13. ☐ Rotary scoliosis
14. ☐ Degenerative diseases (i.e. osteoporosis)
15. ☐ Definite epiphysitis deformity
16. ☐ Multiple Schmorl's nodes

DESCRIPTION AND DIAGNOSIS _____

APPENDIX E

INFORMED SUBJECT CONSENT

Name _____

Address _____

_____

_____

Personnel: Stephan A. Konz — Professor, Department of Industrial Engineering

Thomas E. Parker — Graduate student, Department of Industrial Engineering

1. I _____ (Name of subject), being of sound mind and _____ years of age, do hereby consent to, authorize and request each of the persons named above (and the agents, employees and fellow employees of each of them) to undertake and perform on me the proposed procedure, treatment, research or investigation (herein called 'Procedure') identified and explained in the document entitled:

   'Moving Weights at the Same Height--Effect of Height, Angle of Movement and Object Volume'

2. I have read the attached document, referred to the above, and I have been fully advised of the Procedure and the possible risks (cardio-vascular and skeleto-muscular strain or damage) and complications involved in it, all of which risks and complications I hereby assume voluntarily.

Signed at _____ this day of _____, 1976, in the presence of the witnesses whose signatures are below, opposite my signature.

Witnessed by:

_____ Signature of subject

_____ First witness signature

_____ Second witness signature

APPENDIX F

				Subject Transfer Order					
Trial				1	2	3	4	5	6
1	45°	Floor	Volume 1	17	23	15	14	7	6
2									
1			Volume 2	4	22	12	5	13	5
2									
1		Knee	Volume 1	6	19	21	1	8	10
2									
1			Volume 2	21	6	24	10	12	11
2									
1		Hip	Volume 1	16	20	1	20	17	19
2									
1			Volume 2	2	4	16	12	7	13
2									
1	90%	Floor	Volume 1	11	2	18	19	15	9
2									
1			Volume 2	3	9	3	15	24	8
2									
1		Knee	Volume 1	23	21	2	24	11	17
2									
1			Volume 2	8	5	20	9	14	22
2									
1		Hip	Volume 1	22	18	23	13	10	4
2									
1			Volume 2	7	3	14	18	16	7
2									
1	135°	Floor	Volume 1	18	16	7	7	3	14
2									
1			Volume 2	13	10	4	22	18	23
2									
1		Knee	Volume 1	9	14	22	8	5	20
2									
1			Volume 2	24	11	17	23	21	2
2									
1		Hip	Volume 1	15	24	8	3	9	3
2									
1			Volume 2	19	15	9	11	2	18
2									
1	180°	Floor	Volume 1	12	7	13	2	4	16
2									
1			Volume 2	20	17	19	16	20	1
2									
1		Knee	Volume 1	10	12	11	21	6	24
2									
1			Volume 2	1	8	10	6	19	21
2									
1		Hip	Volume 1	5	13	5	4	22	12
2									
1			Volume 2	14	1	6	17	23	15
2									

Trial 3 and 4 were a mirror image of trial 1 and 2

APPENDIX G

SUBJECT TASK RATING SCALE

1 = very, very light. Prepared to do continuously for 8 hours.

2 = very light. Prepared to do one per minute for 8 hours.

3 = fairly light. Prepared to do one per 10 minutes for 8 hours.

4 = fairly hard. Prepared to do one per hour for 8 hours.

5 = hard. Prepared to do one per 2 hours for 8 hours.

6 = very hard. Prepared to do one per day.

7 = very, very hard. Refuse to do the task.

LIFT	SEQ #	SUB	ANGLE	HT	VOL	TRIAL	LF(A)	LF(B)	VF(A)	VF(B)	VF(C)	FF(A)	FF(B)	ST(A)	CT(A)	CT(B)	TT(B)	VOTE
33.00	1.00	1.00	1.00	1.00	1.00	1.00	1.25	2.45	11.23	10.40	11.65	1.49	2.03	6.72	3.39	-0.22	1.25	3.00
34.00	2.00	1.00	1.00	1.00	1.00	2.00	1.04	1.91	11.65	11.65	12.48	2.71	1.76	6.52	2.78	0.73	1.40	3.00
63.00	3.00	1.00	1.00	1.00	1.00	3.00	1.36	1.09	13.32	13.73	13.32	2.37	5.42	8.02	2.34	-0.56	1.40	2.00
64.00	4.00	1.00	1.00	1.00	1.00	4.00	2.18	1.36	10.40	10.82	8.32	2.03	6.23	7.32	3.34	-0.73	1.34	2.00
7.00	5.00	1.00	1.00	1.00	2.00	1.00	1.63	2.12	8.75	10.42	10.42	1.94	2.96	6.36	3.87	0.23	1.46	3.80
8.00	6.00	1.00	1.00	1.00	2.00	2.00	1.19	2.60	6.67	10.01	4.59	2.36	2.36	6.05	3.07	-0.56	1.35	3.50
89.00	7.00	1.00	1.00	1.00	2.00	3.00	1.36	1.85	14.15	11.65	9.15	2.37	4.00	7.22	3.45	2.14	1.71	2.00
90.00	8.00	1.00	1.00	1.00	2.00	4.00	1.20	1.20	13.32	12.48	8.32	2.00	3.93	6.72	2.78	2.36	1.46	2.00
11.00	9.00	1.00	1.00	1.00	2.00	1.00	1.00	0.76	2.77	3.34	5.42	6.25	1.81	2.20	8.00	3.34	1.58	2.08	3.00
12.00	10.00	1.00	1.00	1.00	2.00	1.00	2.00	1.08	1.30	4.17	5.42	2.92	1.64	1.28	8.20	2.91	1.58	1.79	2.80
85.00	11.00	1.00	1.00	1.00	2.00	1.00	3.00	1.53	1.69	4.58	6.24	4.58	0.91	2.54	6.32	4.61	1.07	1.40	1.00
86.00	12.00	1.00	1.00	1.00	2.00	1.00	4.00	2.72	1.31	7.49	4.99	5.41	1.12	2.27	7.42	4.06	4.66	1.80	1.00
41.00	13.00	1.00	1.00	1.00	2.00	2.00	1.00	0.71	1.58	5.41	7.07	5.41	1.73	2.27	7.32	3.45	0.11	1.72	2.50
42.00	14.00	1.00	1.00	1.00	2.00	2.00	2.00	0.71	2.02	5.41	9.15	9.15	1.46	3.56	6.82	2.95	-0.17	1.50	2.50
55.00	15.00	1.00	1.00	1.00	2.00	2.00	3.00	0.98	1.47	5.83	6.24	8.32	1.22	3.39	5.82	2.11	0.67	1.37	1.20
56.00	16.00	1.00	1.00	1.00	2.00	2.00	4.00	1.25	1.63	5.41	7.49	4.16	2.44	2.44	8.23	2.78	1.69	1.68	1.20
31.00	17.00	1.00	1.00	1.00	3.00	1.00	1.00	0.76	1.53	0.00	4.99	0.00	0.85	1.35	7.32	1.78	3.77	1.63	1.00
32.00	18.00	1.00	1.00	1.00	3.00	1.00	2.00	0.87	1.63	0.00	4.99	0.00	1.35	1.63	7.22	1.67	4.72	1.71	1.00
65.00	19.00	1.00	1.00	1.00	3.00	1.00	3.00	1.47	1.47	2.08	4.99	0.00	0.41	1.15	7.32	0.72	6.58	2.01	1.00
66.00	20.00	1.00	1.00	1.00	3.00	1.00	4.00	1.25	1.63	1.66	4.99	0.00	0.95	1.69	7.02	1.11	6.58	1.65	1.00
3.00	21.00	1.00	1.00	1.00	3.00	2.00	1.00	2.06	1.63	0.00	5.42	0.00	1.51	1.67	8.72	2.23	4.39	1.85	2.80
4.00	22.00	1.00	1.00	1.00	3.00	2.00	2.00	1.30	1.25	0.00	5.00	0.00	1.05	1.38	8.41	1.17	5.18	1.92	2.50
93.00	23.00	1.00	1.00	1.00	3.00	2.00	3.00	1.14	1.14	0.83	4.99	0.00	1.19	1.15	9.93	2.17	7.02	1.95	1.50
94.00	24.00	1.00	1.00	1.00	3.00	2.00	4.00	0.11	0.11	0.83	4.99	0.00	1.35	1.22	10.43	1.89	6.46	1.82	1.50
21.00	25.00	1.00	2.00	1.00	1.00	1.00	1.57	2.39	5.84	7.92	7.09	1.90	3.88	8.20	5.41	2.14	2.16	3.50
22.00	26.00	1.00	2.00	1.00	1.00	2.00	2.44	2.28	5.00	12.51	9.17	2.50	2.40	6.77	4.66	2.81	1.61	3.50
75.00	27.00	1.00	2.00	1.00	1.00	3.00	1.58	2.07	10.82	13.32	10.82	2.13	3.12	7.02	4.00	2.25	2.29	3.00
76.00	28.00	1.00	2.00	1.00	1.00	4.00	2.89	2.13	12.48	11.65	8.32	2.74	2.98	7.32	4.06	1.85	1.62	2.80
5.00	29.00	1.00	2.00	1.00	2.00	1.00	2.17	2.60	10.42	15.43	12.92	2.96	2.13	5.43	4.72	0.45	1.35	3.50
6.00	30.00	1.00	2.00	1.00	2.00	2.00	2.82	3.20	6.25	5.84	4.59	2.30	2.99	7.38	4.24	0.28	1.66	3.50
91.00	31.00	1.00	2.00	1.00	2.00	3.00	2.18	2.18	7.49	12.07	8.32	3.01	2.95	7.32	5.00	1.29	2.04	2.50
92.00	32.00	1.00	2.00	1.00	2.00	4.00	1.25	2.62	9.99	11.65	8.32	2.23	2.71	6.32	3.78	8.04	2.09	2.50
45.00	33.00	1.00	2.00	2.00	1.00	1.00	1.25	1.91	7.07	10.40	7.49	1.76	3.79	5.72	4.73	0.45	2.17	2.50
46.00	34.00	1.00	2.00	2.00	1.00	2.00	1.25	1.25	10.40	8.32	10.40	1.25	2.64	7.52	4.61	-0.17	1.72	2.50
51.00	35.00	1.00	2.00	2.00	1.00	3.00	0.98	1.91	5.83	8.32	5.83	0.74	1.69	4.31	5.00	1.12	1.50	2.50
52.00	36.00	1.00	2.00	2.00	1.00	4.00	1.63	2.18	5.41	8.32	4.16	1.25	3.28	5.02	4.56	2.25	1.83	2.50
15.00	37.00	1.00	2.00	2.00	2.00	1.00	1.19	1.25	2.50	7.50	0.83	1.54	1.71	7.18	2.23	0.96	1.57	2.80
16.00	38.00	1.00	2.00	2.00	2.00	2.00	1.46	2.06	2.92	7.09	2.50	1.97	2.63	6.15	4.88	2.81	1.67	2.80
81.00	39.00	1.00	2.00	2.00	2.00	3.00	2.13	1.47	4.16	7.07	0.00	2.47	3.01	7.22	5.50	3.93	1.91	2.50
82.00	40.00	1.00	2.00	2.00	2.00	4.00	1.63	1.53	4.16	8.32	1.66	3.32	1.96	7.32	5.12	2.42	1.94	2.50
43.00	41.00	1.00	2.00	3.00	1.00	1.00	0.44	2.13	0.00	4.99	0.00	0.88	1.12	5.32	2.84	4.38	1.74	1.00
44.00	42.00	1.00	2.00	3.00	1.00	2.00	1.09	1.63	0.00	4.99	0.00	1.29	1.02	5.82	2.72	6.91	2.01	1.00
53.00	43.00	1.00	2.00	3.00	1.00	3.00	1.63	1.69	1.66	5.41	0.00	1.52	1.69	6.42	4.56	5.79	2.03	1.20
54.00	44.00	1.00	2.00	3.00	1.00	4.00	1.36	1.63	2.08	4.16	0.00	0.68	1.79	7.22	2.78	6.07	1.95	1.20
13.00	45.00	1.00	2.00	3.00	2.00	1.00	1.19	1.19	0.00	5.42	0.00	2.10	1.77	6.97	4.88	4.50	1.85	1.20
14.00	46.00	1.00	2.00	3.00	2.00	2.00	1.46	1.19	0.00	5.00	0.00	1.58	1.41	7.08	4.08	5.74	1.93	1.20
83.00	47.00	1.00	2.00	3.00	2.00	3.00	1.09	1.63	0.00	6.66	0.00	1.08	1.90	7.22	4.00	8.54	2.03	2.00
84.00	48.00	1.00	2.00	3.00	2.00	4.00	1.36	1.74	0.00	6.66	0.00	0.68	1.69	8.33	4.89	7.76	1.98	2.00

LIFT	SEQ #	SUB	ANGLE	HT	VOL	TRIAL	LF(A)	LF(B)	VF(A)	VF(B)	VF(C)	FF(A)	FF(B)	ST(A)	CT(A)	CT(B)	TT(B)	VOTE
35.00	49.00	1.00	3.00	1.00	1.00	1.00	1.63	3.81	9.99	12.48	9.15	2.54	2.30	6.22	4.45	1.91	1.88	3.20
36.00	50.00	1.00	3.00	1.00	1.00	2.00	3.00	1.85	5.41	11.65	5.41	3.39	3.25	7.02	6.51	3.48	1.88	3.20
61.00	51.00	1.00	3.00	1.00	1.00	3.00	2.72	2.29	10.82	10.40	13.32	2.95	3.96	7.22	6.67	1.69	1.74	3.00
62.00	52.00	1.00	3.00	1.00	1.00	4.00	2.62	3.27	9.99	9.15	9.15	3.05	4.13	6.52	5.00	2.81	2.09	3.00
25.00	53.00	1.00	3.00	1.00	2.00	1.00	3.27	1.74	10.40	9.57	9.15	1.96	2.98	6.72	7.34	1.12	1.59	3.80
26.00	54.00	1.00	3.00	1.00	2.00	2.00	1.96	1.47	9.15	10.82	12.07	2.17	3.15	7.02	7.12	-0.17	1.57	3.80
71.00	55.00	1.00	3.00	1.00	2.00	3.00	2.62	2.18	10.40	14.56	13.32	2.84	3.39	7.72	6.12	3.37	2.47	3.50
72.00	56.00	1.00	3.00	1.00	2.00	4.00	2.18	2.13	13.73	12.48	13.32	1.93	3.39	8.53	5.50	4.72	2.58	3.50
17.00	57.00	1.00	3.00	2.00	1.00	1.00	0.87	1.19	2.08	5.84	2.50	1.97	2.73	6.15	6.52	0.17	1.69	3.00
18.00	58.00	1.00	3.00	2.00	1.00	2.00	1.57	1.25	2.08	5.84	2.08	2.04	2.10	7.79	5.94	4.50	1.90	3.00
79.00	59.00	1.00	3.00	2.00	1.00	3.00	2.72	2.89	7.49	8.74	2.50	1.96	3.66	4.81	7.17	3.43	2.29	2.50
80.00	60.00	1.00	3.00	2.00	1.00	4.00	1.74	2.13	4.16	7.91	4.16	1.96	1.83	6.42	6.78	2.25	1.95	2.50
47.00	61.00	1.00	3.00	2.00	2.00	1.00	1.09	2.13	4.16	9.57	2.08	1.56	2.78	4.41	6.23	2.98	2.20	3.00
48.00	62.00	1.00	3.00	2.00	2.00	2.00	1.63	1.63	4.16	9.15	2.50	1.69	2.64	6.82	4.45	2.75	1.86	3.00
49.00	63.00	1.00	3.00	2.00	2.00	3.00	1.63	1.91	4.16	9.15	4.99	1.56	2.78	5.02	6.56	0.90	1.98	3.00
50.00	64.00	1.00	3.00	2.00	2.00	4.00	2.18	2.18	4.16	6.24	2.50	1.49	2.71	8.73	5.95	4.05	1.97	3.00
29.00	65.00	1.00	3.00	3.00	1.00	1.00	0.55	2.34	0.00	5.41	0.00	0.74	1.42	6.02	5.56	5.00	1.86	2.20
30.00	66.00	1.00	3.00	3.00	1.00	2.00	0.71	1.58	0.00	5.41	0.00	2.27	1.46	7.22	6.06	5.51	1.89	2.20
67.00	67.00	1.00	3.00	3.00	1.00	3.00	1.20	1.74	0.00	5.41	0.00	1.19	1.79	7.42	6.00	3.37	1.91	1.30
68.00	68.00	1.00	3.00	3.00	1.00	4.00	1.20	2.29	0.00	5.41	0.00	0.41	1.79	6.22	7.01	5.90	1.71	1.30
37.00	69.00	1.00	3.00	3.00	2.00	1.00	1.58	2.13	0.00	6.66	0.00	1.69	1.73	7.02	6.62	6.07	2.11	2.00
38.00	70.00	1.00	3.00	3.00	2.00	2.00	1.25	1.69	0.00	5.83	0.00	1.49	1.52	8.23	6.67	4.95	1.79	2.00
59.00	71.00	1.00	3.00	3.00	2.00	3.00	1.14	2.29	0.00	5.83	0.00	0.85	1.73	7.02	6.23	7.47	2.33	2.50
60.00	72.00	1.00	3.00	3.00	2.00	4.00	1.91	2.23	0.00	6.66	0.00	2.61	2.47	8.63	6.56	7.87	2.01	2.50
23.00	73.00	1.00	4.00	1.00	1.00	1.00	1.25	2.07	5.83	9.57	5.41	2.57	4.10	7.22	7.06	1.24	1.82	4.00
24.00	74.00	1.00	4.00	1.00	1.00	2.00	1.69	2.18	8.32	9.57	5.83	2.54	3.12	6.82	5.67	3.32	1.83	4.00
73.00	75.00	1.00	4.00	1.00	1.00	3.00	3.38	1.58	11.23	15.40	12.48	3.12	3.83	6.32	6.89	2.25	2.01	3.80
74.00	76.00	1.00	4.00	1.00	1.00	4.00	3.27	1.63	12.48	16.64	15.81	4.30	3.12	8.02	6.28	3.26	1.91	3.80
39.00	77.00	1.00	4.00	1.00	2.00	1.00	1.20	3.22	16.64	12.07	9.15	2.51	2.84	5.82	6.39	1.57	1.83	4.20
40.00	78.00	1.00	4.00	1.00	2.00	2.00	2.45	2.62	8.32	15.81	8.32	3.05	3.79	6.52	6.78	1.85	2.59	4.20
57.00	79.00	1.00	4.00	1.00	2.00	3.00	0.60	2.45	8.32	10.40	9.99	2.27	3.12	6.22	6.67	1.01	2.03	4.00
58.00	80.00	1.00	4.00	1.00	2.00	4.00	3.49	1.63	8.32	10.82	11.23	1.79	3.08	7.02	8.34	1.57	2.20	4.00
19.00	81.00	1.00	4.00	2.00	1.00	1.00	1.30	1.63	2.08	5.00	1.25	1.74	2.63	6.77	5.41	0.96	1.79	3.70
20.00	82.00	1.00	4.00	2.00	1.00	2.00	0.98	1.08	2.08	4.17	0.00	1.08	2.59	7.18	5.41	4.22	2.18	3.70
77.00	83.00	1.00	4.00	2.00	1.00	3.00	1.36	2.23	4.58	7.07	0.83	1.35	2.88	3.61	5.50	3.26	1.95	3.00
78.00	84.00	1.00	4.00	2.00	1.00	4.00	0.55	2.13	4.16	5.41	1.66	1.49	2.00	6.32	5.73	4.50	1.57	3.00
1.00	85.00	1.00	4.00	2.00	2.00	1.00	1.95	1.68	4.17	8.34	2.50	3.28	2.73	4.72	7.53	1.86	2.08	3.00
2.00	86.00	1.00	4.00	2.00	2.00	2.00	2.66	3.04	4.59	8.34	2.50	1.94	2.63	6.15	7.42	3.15	2.23	3.00
95.00	87.00	1.00	4.00	2.00	2.00	3.00	0.65	2.62	7.07	9.15	1.25	1.76	2.54	4.51	7.23	7.08	2.11	2.80
96.00	88.00	1.00	4.00	2.00	2.00	4.00	1.31	1.74	3.33	7.91	2.91	1.93	2.27	7.32	7.17	2.81	1.92	2.80
9.00	89.00	1.00	4.00	3.00	1.00	1.00	0.65	1.74	0.00	5.00	0.00	1.08	1.90	5.33	7.42	2.98	1.76	2.70
10.00	90.00	1.00	4.00	3.00	1.00	2.00	1.19	2.22	0.00	5.00	0.00	1.41	1.64	7.49	7.74	5.18	1.82	2.70
87.00	91.00	1.00	4.00	3.00	1.00	3.00	0.71	2.45	1.25	5.83	0.00	0.61	2.81	3.31	7.34	4.61	1.79	2.50
88.00	92.00	1.00	4.00	3.00	1.00	4.00	1.04	2.18	1.25	5.83	0.00	0.81	2.57	3.01	7.78	5.73	1.62	2.50
27.00	93.00	1.00	4.00	3.00	2.00	1.00	2.18	1.36	1.25	7.49	2.50	1.96	6.43	8.43	8.84	5.45	1.80	3.00
28.00	94.00	1.00	4.00	3.00	2.00	2.00	0.27	3.27	1.25	9.15	0.00	0.68	2.84	4.41	8.51	5.62	1.72	3.00
69.00	95.00	1.00	4.00	3.00	2.00	3.00	0.82	1.74	1.66	9.57	0.00	0.85	4.16	6.22	9.45	5.06	1.72	3.00
70.00	96.00	1.00	4.00	3.00	2.00	4.00	0.76	2.83	2.50	8.74	0.00	1.83	2.98	7.92	8.28	6.86	1.98	3.00

LIFT	SEQ #	SUB	ANGLE	HT	VOL	TRIAL	LF(A)	LF(B)	VF(A)	VF(B)	VF(C)	FF(A)	FF(B)	ST(A)	CT(A)	CT(B)	TT(B)	VOTE
45.00	1.00	2.00	1.00	1.00	1.00	1.00	1.30	1.15	9.62	12.55	6.28	1.67	2.98	6.02	2.43	1.17	1.48	3.30
46.00	2.00	2.00	1.00	1.00	1.00	2.00	0.63	1.30	8.37	12.55	9.20	2.06	1.99	6.32	2.84	1.02	1.53	3.30
51.00	3.00	2.00	1.00	1.00	1.00	3.00	1.93	0.73	5.86	7.53	5.44	2.49	2.22	7.22	2.54	0.77	1.48	3.50
52.00	4.00	2.00	1.00	1.00	1.00	4.00	0.94	0.94	5.44	6.69	5.02	1.28	1.73	7.32	1.52	1.02	1.41	3.30
43.00	5.00	2.00	1.00	1.00	2.00	1.00	1.15	1.30	6.28	9.62	7.95	2.35	2.68	7.32	3.35	0.61	1.64	3.50
44.00	6.00	2.00	1.00	1.00	2.00	2.00	1.36	1.72	7.95	9.20	6.28	1.34	1.99	6.22	3.14	1.53	1.35	3.50
53.00	7.00	2.00	1.00	1.00	2.00	3.00	1.20	1.30	5.02	5.44	5.44	2.42	1.96	7.02	2.94	0.82	1.68	3.80
54.00	8.00	2.00	1.00	1.00	2.00	4.00	2.09	1.04	7.11	7.11	7.11	2.91	2.91	6.82	3.45	0.92	1.61	3.80
37.00	9.00	2.00	1.00	2.00	1.00	1.00	1.25	0.78	5.44	6.28	2.09	0.98	2.03	6.92	2.79	0.66	1.36	3.00
38.00	10.00	2.00	1.00	2.00	1.00	2.00	0.63	1.04	5.02	6.28	4.18	1.18	2.29	6.22	2.13	1.12	1.41	3.00
59.00	11.00	2.00	1.00	2.00	1.00	3.00	1.30	0.73	5.02	5.02	2.93	0.98	1.63	7.32	2.38	1.53	1.48	3.00
60.00	12.00	2.00	1.00	2.00	1.00	4.00	0.68	0.68	2.09	5.02	2.93	1.54	1.96	7.42	2.38	1.68	1.50	3.30
11.00	13.00	2.00	1.00	2.00	2.00	1.00	1.09	0.55	7.49	7.49	3.33	2.20	1.12	8.02	2.45	2.36	1.31	3.50
12.00	14.00	2.00	1.00	2.00	2.00	2.00	1.20	0.82	6.66	6.66	3.33	1.73	2.03	6.42	2.28	2.08	1.42	3.50
85.00	15.00	2.00	1.00	2.00	2.00	3.00	1.10	0.68	4.18	6.69	2.93	1.96	1.31	7.42	3.04	2.19	1.58	3.50
86.00	16.00	2.00	1.00	2.00	2.00	4.00	0.47	0.68	4.18	6.28	2.09	2.29	1.47	7.22	1.93	4.34	1.81	3.50
39.00	17.00	2.00	1.00	3.00	1.00	1.00	0.47	1.04	0.00	5.44	0.00	0.75	1.54	4.81	1.01	2.09	1.48	2.50
40.00	18.00	2.00	1.00	3.00	1.00	2.00	0.31	1.04	0.00	5.44	0.00	0.65	1.01	4.71	1.52	2.65	1.53	2.50
57.00	19.00	2.00	1.00	3.00	1.00	3.00	0.10	1.04	0.00	5.44	0.00	0.65	1.63	4.31	0.71	2.65	1.55	3.00
58.00	20.00	2.00	1.00	3.00	1.00	4.00	0.31	1.04	0.00	5.44	0.00	1.01	1.73	4.31	1.52	2.86	1.48	3.00
7.00	21.00	2.00	1.00	3.00	2.00	1.00	0.55	1.47	1.25	7.07	0.00	1.42	1.79	5.22	2.45	4.72	1.42	1.00
8.00	22.00	2.00	1.00	3.00	2.00	2.00	0.55	1.09	1.25	7.07	0.00	1.69	2.30	6.02	0.56	0.39	1.45	1.00
89.00	23.00	2.00	1.00	3.00	2.00	3.00	0.52	0.94	0.00	7.53	0.00	1.50	1.63	6.52	2.18	5.10	1.84	2.50
90.00	24.00	2.00	1.00	3.00	2.00	4.00	0.63	1.04	0.00	7.95	0.00	2.26	1.44	6.82	1.52	6.12	1.86	2.80
3.00	25.00	2.00	2.00	1.00	1.00	1.00	1.09	2.07	3.74	4.99	2.91	1.73	2.37	5.22	5.00	1.24	1.13	3.00
4.00	26.00	2.00	2.00	1.00	1.00	2.00	2.07	2.02	4.16	7.91	2.50	1.96	2.51	4.31	4.73	0.28	0.98	3.00
93.00	27.00	2.00	2.00	1.00	1.00	3.00	1.72	1.25	4.18	5.44	5.44	1.54	2.84	7.02	3.04	1.33	1.45	2.80
94.00	28.00	2.00	2.00	1.00	1.00	4.00	1.51	1.04	5.86	6.28	6.28	1.63	2.09	6.32	4.56	1.53	1.48	2.80
17.00	29.00	2.00	2.00	1.00	2.00	1.00	2.72	2.07	7.49	12.48	8.74	3.56	2.37	6.22	3.11	1.01	1.07	3.50
18.00	30.00	2.00	2.00	1.00	2.00	2.00	1.25	1.04	7.49	9.15	9.57	2.57	1.86	6.22	2.95	1.12	1.11	3.50
79.00	31.00	2.00	2.00	1.00	2.00	3.00	1.46	1.15	5.86	7.53	7.95	2.68	1.63	8.83	2.59	2.65	1.94	3.80
80.00	32.00	2.00	2.00	1.00	2.00	4.00	1.20	1.04	6.69	7.11	5.02	2.06	1.57	8.93	3.50	3.42	1.97	4.00
41.00	33.00	2.00	2.00	2.00	1.00	1.00	0.68	1.46	4.18	6.28	2.09	1.31	1.60	5.32	3.55	1.68	1.61	3.00
42.00	34.00	2.00	2.00	2.00	1.00	2.00	1.04	1.57	5.02	5.86	5.44	1.86	2.16	6.22	3.19	1.63	1.59	3.50
55.00	35.00	2.00	2.00	2.00	1.00	3.00	1.04	1.04	2.93	5.02	3.35	1.57	1.41	6.92	4.06	1.94	1.61	3.50
56.00	36.00	2.00	2.00	2.00	1.00	4.00	0.68	1.04	5.02	5.02	1.26	1.70	1.86	6.52	4.06	1.43	1.48	3.50
9.00	37.00	2.00	2.00	2.00	2.00	1.00	1.09	0.93	4.16	9.57	2.91	1.29	1.22	5.72	5.45	3.26	1.42	3.50
10.00	38.00	2.00	2.00	2.00	2.00	2.00	1.20	1.20	6.66	9.57	2.91	1.63	1.83	5.62	3.78	2.25	1.11	3.50
87.00	39.00	2.00	2.00	2.00	2.00	3.00	1.15	1.04	2.51	7.53	2.09	1.63	1.96	7.42	3.96	3.06	1.64	3.50
88.00	40.00	2.00	2.00	2.00	2.00	4.00	1.10	1.57	2.51	7.95	2.09	2.03	1.60	7.22	3.40	3.57	1.76	3.50
35.00	41.00	2.00	2.00	3.00	1.00	1.00	0.47	1.15	0.00	6.28	0.00	0.62	1.37	3.81	3.45	2.76	1.51	2.50
36.00	42.00	2.00	2.00	3.00	1.00	2.00	0.63	1.46	0.00	6.69	0.00	0.56	1.57	3.31	3.65	3.37	1.38	2.50
61.00	43.00	2.00	2.00	3.00	1.00	3.00	0.52	1.25	0.00	5.86	0.00	0.39	1.86	3.41	3.55	2.65	1.61	3.00
62.00	44.00	2.00	2.00	3.00	1.00	4.00	0.26	0.84	0.00	5.44	0.00	0.20	1.41	3.61	4.72	2.09	1.51	3.00
5.00	45.00	2.00	2.00	3.00	2.00	1.00	0.55	1.63	0.00	8.74	0.00	1.05	2.07	4.81	3.61	5.06	1.43	2.00
6.00	46.00	2.00	2.00	3.00	2.00	2.00	0.71	1.74	0.00	8.74	0.00	1.08	1.69	4.21	4.45	6.35	1.42	2.00
91.00	47.00	2.00	2.00	3.00	2.00	3.00	0.63	1.15	1.26	8.37	0.00	0.82	1.70	5.22	3.45	4.69	1.73	2.80
92.00	48.00	2.00	2.00	3.00	2.00	4.00	0.52	1.30	1.26	7.95	0.00	0.75	1.67	4.31	4.01	4.08	1.36	2.80

LIFT SEQ #	SUB	ANGLE	HT	VOL	TRIAL	LF(A)	LF(B)	VF(A)	VF(B)	VF(C)	FF(A)	FF(B)	ST(A)	CT(A)	CT(B)	TT(B)	VCTE
31.00 49.00	2.00	3.00	1.00	1.00	1.00	2.18	1.20	2.91	4.99	2.50	2.61	3.08	6.22	4.61	1.12	1.40	4.00
32.00 50.00	2.00	3.00	1.00	1.00	2.00	2.67	1.09	4.16	5.41	3.74	1.96	2.81	7.02	4.61	1.12	1.37	4.00
65.00 51.00	2.00	3.00	1.00	1.00	3.00	2.61	1.04	6.69	5.86	4.18	1.57	2.06	7.32	5.07	2.96	1.81	4.00
66.00 52.00	2.00	3.00	1.00	1.00	4.00	1.67	1.20	6.28	6.28	6.69	2.06	1.70	7.32	4.72	2.65	1.82	4.00
19.00 53.00	2.00	3.00	1.00	2.00	1.00	2.67	1.74	7.49	13.32	7.91	2.40	2.37	6.82	5.56	1.69	1.62	4.00
20.00 54.00	2.00	3.00	1.00	2.00	2.00	1.20	1.58	10.40	11.65	10.40	3.56	1.73	6.62	5.56	1.57	1.33	4.00
77.00 55.00	2.00	3.00	1.00	2.00	3.00	1.10	1.51	5.02	6.69	5.02	2.88	2.35	8.32	4.56	2.70	1.94	4.00
78.00 56.00	2.00	3.00	1.00	2.00	4.00	1.62	1.10	5.44	7.95	5.86	2.06	2.49	8.32	4.72	3.11	1.91	4.00
27.00 57.00	2.00	3.00	2.00	1.00	1.00	1.47	1.25	6.24	5.41	7.49	1.08	1.25	6.22	4.73	1.29	1.56	3.50
28.00 58.00	2.00	3.00	2.00	1.00	2.00	1.91	1.36	6.66	5.41	4.99	1.59	1.46	7.02	3.89	2.25	1.33	3.50
69.00 59.00	2.00	3.00	2.00	1.00	3.00	0.84	1.04	5.86	5.02	4.18	1.60	1.57	7.82	4.56	1.84	1.61	3.50
70.00 60.00	2.00	3.00	2.00	1.00	4.00	1.15	0.68	3.77	5.02	3.35	2.22	1.63	8.32	4.72	2.65	1.84	3.50
21.00 61.00	2.00	3.00	2.00	2.00	1.00	0.76	1.20	5.41	7.49	4.16	1.69	1.59	6.72	5.17	3.82	1.65	4.50
22.00 62.00	2.00	3.00	2.00	2.00	2.00	1.04	0.76	5.41	7.91	5.83	1.76	1.08	7.22	4.78	4.61	1.80	4.50
75.00 63.00	2.00	3.00	2.00	2.00	3.00	0.99	1.51	2.09	8.37	2.51	1.21	1.70	6.82	5.68	4.69	1.94	3.50
76.00 64.00	2.00	3.00	2.00	2.00	4.00	1.04	1.04	2.93	8.37	3.77	1.31	2.06	6.22	5.32	3.93	1.64	3.50
47.00 65.00	2.00	3.00	3.00	1.00	1.00	0.52	1.51	0.00	7.53	0.00	0.29	1.57	3.01	6.19	3.16	1.41	3.00
48.00 66.00	2.00	3.00	3.00	1.00	2.00	0.63	1.46	0.00	7.53	0.00	0.16	1.60	3.51	6.69	2.19	1.48	3.00
49.00 67.00	2.00	3.00	3.00	1.00	3.00	0.52	1.36	0.00	7.53	0.00	0.65	1.60	3.31	7.10	3.47	1.53	2.80
50.00 68.00	2.00	3.00	3.00	1.00	4.00	0.78	1.72	0.00	6.69	0.00	0.23	1.31	3.11	4.92	3.57	1.61	2.80
29.00 69.00	2.00	3.00	3.00	2.00	1.00	1.04	1.31	0.00	5.83	0.00	1.12	1.42	4.61	5.39	3.32	1.48	3.50
30.00 70.00	2.00	3.00	3.00	2.00	2.00	0.71	1.85	0.00	6.24	0.00	0.81	1.29	4.21	5.73	3.82	1.45	3.50
67.00 71.00	2.00	3.00	3.00	2.00	3.00	0.52	1.57	0.00	7.53	0.00	0.75	1.70	5.02	6.44	3.21	1.32	3.50
68.00 72.00	2.00	3.00	3.00	2.00	4.00	0.99	1.20	0.00	7.95	0.00	1.37	1.70	3.91	5.22	4.59	1.48	3.50
13.00 73.00	2.00	4.00	1.00	1.00	1.00	0.65	1.14	8.32	11.23	7.49	1.63	2.03	5.82	6.84	0.11	1.22	4.00
14.00 74.00	2.00	4.00	1.00	1.00	2.00	1.04	1.58	7.49	7.91	8.32	1.19	1.96	5.22	7.62	0.56	1.25	4.00
83.00 75.00	2.00	4.00	1.00	1.00	3.00	2.61	1.30	6.28	7.11	7.11	1.70	2.65	7.32	5.02	2.19	1.92	3.50
84.00 76.00	2.00	4.00	1.00	1.00	4.00	1.98	1.57	6.28	7.11	6.69	3.47	2.58	6.42	6.34	3.06	1.91	3.80
33.00 77.00	2.00	4.00	1.00	2.00	1.00	3.18	1.20	4.18	8.37	5.44	1.08	2.75	6.12	5.68	1.63	1.68	5.50
34.00 78.00	2.00	4.00	1.00	2.00	2.00	2.40	1.04	6.28	11.30	7.53	1.57	2.45	6.72	6.24	1.63	1.86	5.50
63.00 79.00	2.00	4.00	1.00	2.00	3.00	0.94	1.62	5.86	7.53	5.02	2.29	2.03	7.62	6.59	2.04	1.97	4.00
64.00 80.00	2.00	4.00	1.00	2.00	4.00	1.51	1.67	5.86	7.11	3.35	2.62	2.19	7.82	6.39	2.25	1.96	4.00
23.00 81.00	2.00	4.00	2.00	1.00	1.00	1.09	1.31	7.49	6.24	5.83	1.69	1.86	5.32	5.62	1.35	1.19	5.00
24.00 82.00	2.00	4.00	2.00	1.00	2.00	1.58	1.14	5.41	5.41	6.24	1.76	1.76	6.42	4.56	2.70	1.48	5.00
73.00 83.00	2.00	4.00	2.00	1.00	3.00	1.04	0.73	4.18	7.11	2.93	0.98	2.55	5.22	6.09	2.70	1.48	3.50
74.00 84.00	2.00	4.00	2.00	1.00	4.00	0.94	0.94	4.18	7.11	2.93	1.28	1.99	5.82	5.07	2.25	1.50	3.50
15.00 85.00	2.00	4.00	2.00	2.00	1.00	1.25	1.09	7.49	11.65	6.24	2.30	1.86	6.32	6.95	4.10	1.82	4.00
16.00 86.00	2.00	4.00	2.00	2.00	2.00	1.09	1.31	5.83	9.15	5.41	1.69	1.90	6.22	6.78	3.37	1.69	4.00
81.00 87.00	2.00	4.00	2.00	2.00	3.00	1.10	0.99	3.77	8.37	2.09	1.24	2.03	8.02	6.09	5.41	2.02	3.80
82.00 88.00	2.00	4.00	2.00	2.00	4.00	0.84	1.15	2.93	8.79	2.93	1.08	0.88	5.72	5.17	4.24	1.68	3.80
25.00 89.00	2.00	4.00	3.00	1.00	1.00	0.44	2.13	0.00	5.41	0.00	0.44	1.32	2.61	5.12	2.08	1.16	2.50
26.00 90.00	2.00	4.00	3.00	1.00	2.00	0.55	1.53	0.00	6.24	0.00	0.51	1.08	2.31	4.34	2.59	1.10	2.50
71.00 91.00	2.00	4.00	3.00	1.00	3.00	0.26	1.72	0.00	6.28	0.00	0.20	2.06	2.81	6.54	1.53	1.28	3.00
72.00 92.00	2.00	4.00	3.00	1.00	4.00	0.16	1.72	0.00	6.28	0.00	0.07	1.54	1.30	6.59	2.14	1.23	3.00
1.00 93.00	2.00	4.00	3.00	2.00	1.00	0.76	2.29	0.00	7.91	0.00	0.30	2.30	3.01	6.34	2.30	0.96	4.00
2.00 94.00	2.00	4.00	3.00	2.00	2.00	0.27	2.02	0.00	7.49	0.00	1.12	2.10	3.01	6.73	3.65	1.10	4.00
95.00 95.00	2.00	4.00	3.00	2.00	3.00	0.73	1.67	0.00	9.20	0.00	0.43	1.41	2.31	7.25	3.93	1.48	3.00
96.00 96.00	2.00	4.00	3.00	2.00	4.00	0.52	1.67	1.26	8.37	0.00	0.00	1.41	2.41	7.66	2.65	1.41	3.00

LIFT	SEQ #	SUE	ANGLE	FT	VOL	TRIAL	LF(A)	LF(B)	VF(A)	VF(B)	VF(C)	FF(A)	FF(B)	ST(A)	CT(A)	CT(B)	TT(B)	VOTE
29.00	1.00	3.00	1.00	1.00	1.00	1.00	2.29	2.72	4.99	9.57	0.00	2.78	4.30	8.23	4.61	0.67	1.48	2.20
30.00	2.00	3.00	1.00	1.00	1.00	2.00	1.09	1.42	4.99	5.41	2.08	1.86	3.42	8.13	4.56	0.45	1.04	2.20
67.00	3.00	3.00	1.00	1.00	1.00	3.00	1.57	1.67	9.20	11.30	4.18	2.45	2.84	7.32	4.51	0.31	1.55	2.20
68.00	4.00	3.00	1.00	1.00	1.00	4.00	1.57	1.98	6.28	11.30	4.18	1.96	2.68	6.32	4.97	0.10	1.22	2.20
23.00	5.00	3.00	1.00	1.00	2.00	1.00	1.63	2.18	4.99	7.49	1.66	2.37	3.86	7.02	4.00	0.39	1.31	2.20
24.00	6.00	3.00	1.00	1.00	2.00	2.00	2.07	1.53	3.33	7.07	0.00	2.71	4.00	6.42	3.89	0.45	1.19	2.20
73.00	7.00	3.00	1.00	1.00	2.00	3.00	2.71	1.04	9.62	13.39	3.77	1.99	3.27	7.02	4.46	0.61	1.51	1.50
74.00	8.00	3.00	1.00	1.00	2.00	4.00	2.61	1.67	7.95	8.37	3.35	2.35	2.62	8.02	4.41	0.26	1.61	1.50
41.00	9.00	3.00	1.00	2.00	1.00	1.00	0.82	1.80	2.91	7.49	3.33	1.79	3.18	7.02	3.61	1.46	1.37	2.20
42.00	10.00	3.00	1.00	2.00	1.00	2.00	0.87	1.74	2.08	5.41	0.00	3.01	3.35	5.32	4.56	1.46	1.16	2.20
55.00	11.00	3.00	1.00	2.00	1.00	3.00	1.25	1.63	5.83	7.91	4.16	1.66	2.71	6.32	3.67	2.14	1.31	1.40
56.00	12.00	3.00	1.00	2.00	1.00	4.00	0.98	2.07	4.16	7.91	2.50	1.49	2.10	6.92	4.00	4.38	1.50	1.40
47.00	13.00	3.00	1.00	2.00	2.00	1.00	1.20	1.58	2.91	7.07	0.00	2.03	3.86	7.52	3.67	2.42	1.39	1.50
48.00	14.00	3.00	1.00	2.00	2.00	2.00	1.09	1.53	1.25	4.99	0.00	1.19	2.51	7.02	4.45	4.33	1.42	1.50
49.00	15.00	3.00	1.00	2.00	2.00	3.00	1.04	1.80	1.25	4.99	0.00	1.42	3.15	8.33	3.78	2.36	1.46	1.50
50.00	16.00	3.00	1.00	2.00	2.00	4.00	0.71	1.74	2.91	4.99	0.00	1.69	3.05	7.32	5.34	2.70	1.39	1.50
1.00	17.00	3.00	1.00	3.00	1.00	1.00	0.98	1.58	0.83	4.99	0.00	0.41	1.25	7.52	2.78	4.38	1.45	1.00
2.00	18.00	3.00	1.00	3.00	1.00	2.00	0.65	1.09	1.25	5.41	0.00	1.02	2.37	5.82	1.78	4.10	1.25	1.00
95.00	19.00	3.00	1.00	3.00	1.00	3.00	0.47	0.99	0.00	5.02	0.00	0.62	1.57	7.12	2.23	2.14	1.51	1.00
96.00	20.00	3.00	1.00	3.00	1.00	4.00	0.52	1.15	0.00	5.02	0.00	0.56	1.63	6.02	2.64	2.19	1.33	1.00
31.00	21.00	3.00	1.00	3.00	2.00	1.00	1.25	1.69	0.00	6.24	0.00	1.79	2.07	5.92	2.72	5.23	1.65	1.00
32.00	22.00	3.00	1.00	3.00	2.00	2.00	1.14	1.31	0.00	5.41	0.00	1.42	1.76	6.92	2.67	5.51	1.60	1.00
65.00	23.00	3.00	1.00	3.00	2.00	3.00	0.78	0.99	0.00	7.11	0.00	1.01	1.77	8.02	2.18	4.49	1.69	1.00
66.00	24.00	3.00	1.00	3.00	2.00	4.00	0.84	1.04	0.00	7.11	0.00	2.03	2.22	7.32	2.54	4.80	1.87	1.00
35.00	25.00	3.00	2.00	1.00	1.00	1.00	1.09	2.07	8.32	7.49	5.41	2.71	3.52	7.82	3.89	0.22	1.56	2.40
36.00	26.00	3.00	2.00	1.00	1.00	2.00	2.72	2.13	6.24	5.41	4.99	2.98	4.74	6.32	5.12	1.57	1.34	2.40
61.00	27.00	3.00	2.00	1.00	1.00	3.00	2.34	2.29	8.32	15.40	4.99	2.23	3.72	7.72	4.56	1.74	1.72	2.30
62.00	28.00	3.00	2.00	1.00	1.00	4.00	2.29	2.13	6.66	9.99	5.41	2.51	3.96	7.82	5.00	1.57	1.54	2.30
5.00	29.00	3.00	2.00	1.00	2.00	1.00	2.18	3.27	8.32	8.74	4.16	2.71	4.40	7.32	6.78	1.91	1.83	2.20
6.00	30.00	3.00	2.00	1.00	2.00	2.00	1.31	2.18	7.91	8.32	4.16	2.37	3.15	7.32	5.67	2.53	2.04	2.20
91.00	31.00	3.00	2.00	1.00	2.00	3.00	3.39	1.57	8.37	9.62	5.02	3.34	2.94	8.43	5.17	1.68	2.07	2.30
92.00	32.00	3.00	2.00	1.00	2.00	4.00	2.45	1.57	5.02	8.37	3.77	2.29	2.35	8.22	4.56	1.89	2.01	2.30
3.00	33.00	3.00	2.00	2.00	1.00	1.00	0.55	1.63	6.24	10.40	1.25	1.59	3.35	5.02	4.89	1.01	1.37	1.20
4.00	34.00	3.00	2.00	2.00	1.00	2.00	0.55	2.18	4.16	7.49	2.50	1.19	3.39	6.72	4.34	0.67	1.22	1.20
93.00	35.00	3.00	2.00	2.00	1.00	3.00	1.10	0.84	4.18	5.86	1.26	1.44	2.91	7.52	3.75	0.66	1.48	1.80
94.00	36.00	3.00	2.00	2.00	1.00	4.00	0.84	1.62	3.35	6.28	1.26	1.37	2.58	7.82	4.21	2.14	1.55	1.80
39.00	37.00	3.00	2.00	2.00	2.00	1.00	1.36	1.74	2.08	4.16	0.00	2.03	2.71	8.43	4.56	1.80	1.65	2.20
40.00	38.00	3.00	2.00	2.00	2.00	2.00	1.25	2.18	2.08	4.99	0.00	1.25	2.47	7.02	5.56	5.51	1.71	2.20
57.00	39.00	3.00	2.00	2.00	2.00	3.00	1.14	1.58	5.41	8.32	1.66	2.30	3.22	7.02	5.67	2.36	1.42	1.50
58.00	40.00	3.00	2.00	2.00	2.00	4.00	1.63	2.02	5.41	8.32	1.25	1.69	2.78	6.82	6.84	4.83	1.71	1.50
45.00	41.00	3.00	2.00	3.00	1.00	1.00	0.98	1.80	0.00	4.99	0.00	0.44	1.49	4.92	4.06	2.36	1.43	1.00
46.00	42.00	3.00	2.00	3.00	1.00	2.00	0.93	2.07	0.00	4.99	0.00	0.51	1.69	2.91	4.61	3.48	1.37	1.00
51.00	43.00	3.00	2.00	3.00	1.00	3.00	0.76	1.69	0.00	4.16	0.00	0.10	1.76	3.81	4.00	3.37	1.50	1.00
52.00	44.00	3.00	2.00	3.00	1.00	4.00	0.65	1.96	0.00	4.16	0.00	0.30	3.79	3.61	4.61	2.92	1.36	1.00
27.00	45.00	3.00	2.00	3.00	2.00	1.00	1.25	1.51	0.00	4.99	0.00	0.88	2.54	7.02	5.78	6.07	1.82	1.00
28.00	46.00	3.00	2.00	3.00	2.00	2.00	1.20	1.96	0.00	5.83	0.00	1.35	2.00	5.32	5.12	5.51	1.56	1.00
69.00	47.00	3.00	2.00	3.00	2.00	3.00	1.04	1.36	0.00	7.53	0.00	1.14	1.96	7.12	4.56	5.10	1.78	1.00
70.00	48.00	3.00	2.00	3.00	2.00	4.00	1.15	1.57	0.00	7.53	0.00	1.01	2.06	5.32	4.77	4.90	1.84	1.00

LIFT	SEQ #	SUB	ANGLE	HT	VOL	TRIAL	LF(A)	LF(B)	VF(A)	VF(B)	VF(C)	FF(A)	FF(B)	ST(A)	CT(A)	CT(B)	TT(B)	VOTE
13.00	49.00	3.00	3.00	1.00	1.00	1.00	1.63	1.31	7.49	9.15	4.16	1.76	3.12	6.32	5.67	0.84	1.54	1.50
14.00	50.00	3.00	3.00	1.00	1.00	2.00	1.74	1.25	7.49	7.49	6.66	2.67	4.74	8.23	7.78	2.36	2.01	1.50
83.00	51.00	3.00	3.00	1.00	1.00	3.00	2.09	1.88	6.69	11.72	5.02	2.71	3.96	9.33	6.69	2.76	2.30	2.30
84.00	52.00	3.00	3.00	1.00	1.00	4.00	1.93	1.93	7.11	10.04	8.37	2.71	3.37	8.83	8.27	3.21	2.07	2.30
7.00	53.00	3.00	3.00	1.00	2.00	1.00	2.18	1.63	7.07	11.23	4.99	2.95	3.79	7.22	6.23	3.32	2.26	2.20
8.00	54.00	3.00	3.00	1.00	2.00	2.00	1.31	1.63	5.41	7.07	3.33	1.96	3.39	6.82	7.95	2.36	2.08	2.20
87.00	55.00	3.00	3.00	1.00	2.00	3.00	2.87	1.98	8.37	8.37	6.28	2.71	3.70	3.21	6.24	3.98	2.50	2.50
90.00	56.00	3.00	3.00	1.00	2.00	4.00	2.09	2.77	5.44	9.20	2.51	2.22	3.27	3.11	6.90	2.70	2.07	2.50
43.00	57.00	3.00	3.00	2.00	1.00	1.00	0.71	2.07	1.66	7.07	0.00	0.68	3.08	6.12	6.89	1.57	1.34	2.20
44.00	58.00	3.00	3.00	2.00	1.00	2.00	0.55	1.96	1.25	5.41	0.00	1.42	2.71	8.02	7.23	2.92	1.63	2.20
53.00	59.00	3.00	3.00	2.00	1.00	3.00	1.09	1.74	2.91	5.41	0.00	0.85	2.57	5.22	7.06	1.85	1.40	1.50
54.00	60.00	3.00	3.00	2.00	1.00	4.00	0.55	2.18	4.16	5.41	3.74	1.08	2.98	6.22	6.78	2.02	1.27	1.50
33.00	61.00	3.00	3.00	2.00	2.00	1.00	1.80	1.96	3.33	7.07	1.25	1.42	2.84	6.22	6.17	3.82	1.65	2.40
34.00	62.00	3.00	3.00	2.00	2.00	2.00	1.31	1.85	2.91	5.41	0.83	2.57	2.37	7.22	6.34	3.54	1.57	2.40
63.00	63.00	3.00	3.00	2.00	2.00	3.00	0.49	2.34	3.33	9.57	0.00	1.35	2.88	5.72	6.84	3.09	1.79	2.20
64.00	64.00	3.00	3.00	2.00	2.00	4.00	1.04	1.74	2.50	9.15	0.00	1.49	3.39	6.22	6.56	4.33	1.56	2.20
15.00	65.00	3.00	3.00	3.00	1.00	1.00	0.65	2.18	0.00	5.83	0.00	0.95	2.03	3.41	6.56	4.50	1.28	1.00
16.00	66.00	3.00	3.00	3.00	1.00	2.00	0.87	2.02	0.00	6.24	0.00	0.07	2.27	3.31	6.78	3.26	1.13	1.00
81.00	67.00	3.00	3.00	3.00	1.00	3.00	0.94	1.57	0.00	7.53	0.00	0.26	1.34	4.01	6.59	4.49	1.64	1.00
82.00	68.00	3.00	3.00	3.00	1.00	4.00	0.73	2.35	0.00	5.86	0.00	0.92	1.47	5.32	7.10	4.90	1.87	1.00
17.00	69.00	3.00	3.00	3.00	2.00	1.00	0.98	2.13	0.00	7.49	0.00	1.12	2.13	6.72	7.62	7.76	1.86	1.00
18.00	70.00	3.00	3.00	3.00	2.00	2.00	1.47	2.62	0.00	8.32	0.00	0.14	0.24	3.41	7.78	4.66	1.34	1.00
79.00	71.00	3.00	3.00	3.00	2.00	3.00	1.57	1.72	0.00	8.37	0.00	1.44	1.96	7.22	7.51	4.80	2.10	1.00
80.00	72.00	3.00	3.00	3.00	2.00	4.00	1.15	1.83	0.00	9.20	0.00	0.98	1.63	6.52	7.10	5.31	1.92	1.00
25.00	73.00	3.00	4.00	1.00	1.00	1.00	1.14	2.18	4.99	12.48	3.33	2.44	4.50	4.11	7.06	2.14	1.80	2.40
26.00	74.00	3.00	4.00	1.00	1.00	2.00	1.31	1.74	2.50	5.41	0.00	2.98	3.45	6.22	7.23	2.53	1.66	2.40
71.00	75.00	3.00	4.00	1.00	1.00	3.00	1.88	1.15	8.37	10.46	6.69	2.39	4.51	7.12	7.96	1.63	2.17	2.30
72.00	76.00	3.00	4.00	1.00	1.00	4.00	2.92	1.62	6.28	7.95	5.86	1.67	2.19	7.02	7.20	2.35	2.17	2.30
37.00	77.00	3.00	4.00	1.00	2.00	1.00	1.63	1.91	5.41	4.99	4.99	2.78	4.03	8.83	6.34	3.37	2.01	3.00
38.00	78.00	3.00	4.00	1.00	2.00	2.00	2.07	2.94	3.74	4.99	0.00	2.81	3.15	8.93	7.06	2.92	2.18	3.00
59.00	79.00	3.00	4.00	1.00	2.00	3.00	2.18	2.07	5.83	6.66	5.83	2.44	3.72	6.22	7.62	2.36	1.88	2.80
60.00	80.00	3.00	4.00	1.00	2.00	4.00	1.63	2.18	4.16	7.07	6.24	1.63	3.12	8.73	9.12	3.71	2.11	2.80
21.00	81.00	3.00	4.00	2.00	1.00	1.00	0.49	2.67	3.74	5.41	0.00	1.49	2.81	6.22	7.12	3.15	1.57	2.20
22.00	82.00	3.00	4.00	2.00	1.00	2.00	0.55	2.18	2.50	5.83	0.00	0.51	2.84	5.02	6.34	3.15	1.56	2.20
75.00	83.00	3.00	4.00	2.00	1.00	3.00	4.02	1.57	4.18	9.20	2.09	1.50	2.84	6.92	5.58	3.01	1.86	2.50
76.00	84.00	3.00	4.00	2.00	1.00	4.00	1.04	2.19	4.18	9.62	1.26	2.06	2.52	5.72	5.68	4.49	1.69	2.50
19.00	85.00	3.00	4.00	2.00	2.00	1.00	0.55	1.80	3.33	7.49	0.00	2.13	3.05	6.62	6.73	4.89	1.86	2.20
20.00	86.00	3.00	4.00	2.00	2.00	2.00	1.14	1.31	1.66	7.49	0.00	1.22	2.74	6.22	6.67	5.51	1.95	2.20
77.00	87.00	3.00	4.00	2.00	2.00	3.00	1.51	1.93	2.51	10.88	0.84	0.98	1.80	7.62	6.59	4.69	2.33	2.50
78.00	88.00	3.00	4.00	2.00	2.00	4.00	0.89	2.61	4.18	9.20	2.93	0.98	2.35	6.72	6.74	3.67	2.22	2.50
9.00	89.00	3.00	4.00	3.00	1.00	1.00	1.09	2.18	0.00	6.66	0.00	0.54	1.69	4.81	7.28	5.51	1.43	1.00
10.00	90.00	3.00	4.00	3.00	1.00	2.00	0.76	2.18	0.00	5.83	0.00	0.58	1.35	3.41	7.84	3.82	1.27	1.00
87.00	91.00	3.00	4.00	3.00	1.00	3.00	0.63	2.09	0.00	5.44	0.00	0.72	1.63	4.01	6.74	4.44	1.66	1.00
88.00	92.00	3.00	4.00	3.00	1.00	4.00	0.63	2.14	0.00	7.11	0.00	0.13	2.06	3.01	7.71	2.96	1.48	1.00
11.00	93.00	3.00	4.00	3.00	2.00	1.00	1.85	2.40	0.00	8.74	0.00	1.12	1.86	4.31	9.23	6.74	1.56	1.00
12.00	94.00	3.00	4.00	3.00	2.00	2.00	1.63	1.63	0.00	8.32	0.00	0.88	2.13	4.61	8.34	5.96	1.68	1.00
85.00	95.00	3.00	4.00	3.00	2.00	3.00	2.04	1.83	0.00	9.62	0.00	0.98	1.37	4.81	8.37	6.33	1.81	1.30
86.00	96.00	3.00	4.00	3.00	2.00	4.00	1.57	2.09	0.00	9.20	0.00	0.98	1.37	6.02	7.71	5.21	1.97	1.30

LIFT	SEQ #	SUB	ANGLE	HT	VOL	TRIAL	LF(A)	LF(B)	VF(A)	VF(B)	VF(C)	FF(A)	FF(B)	ST(A)	CT(A)	CT(B)	TT(B)	VCTE
27.00	1.00	4.00	1.00	1.00	1.00	1.00	1.67	0.84	3.77	6.28	1.67	1.96	2.55	5.22	4.06	0.00	1.40	3.50
28.00	2.00	4.00	1.00	1.00	1.00	2.00	1.04	1.15	4.18	5.86	2.93	1.63	2.62	6.72	3.19	0.10	1.38	3.50
69.00	3.00	4.00	1.00	1.00	1.00	3.00	0.97	1.08	7.55	7.13	1.26	2.17	2.66	7.20	2.80	0.55	1.35	3.50
70.00	4.00	4.00	1.00	1.00	1.00	4.00	1.46	0.97	5.45	7.55	0.84	3.39	2.20	6.64	3.01	1.65	1.34	3.50
9.00	5.00	4.00	1.00	1.00	2.00	1.00	1.57	1.36	6.69	10.04	5.86	2.29	2.62	6.82	3.45	0.61	1.48	4.00
10.00	6.00	4.00	1.00	1.00	2.00	2.00	1.57	0.73	9.20	9.62	5.02	1.31	2.62	6.52	3.96	0.41	1.28	4.00
87.00	7.00	4.00	1.00	1.00	2.00	3.00	1.19	0.70	3.36	7.55	0.00	2.11	1.71	8.10	2.85	0.82	1.01	4.50
88.00	8.00	4.00	1.00	1.00	2.00	4.00	1.35	0.97	4.19	7.13	0.00	2.83	1.41	5.97	3.27	0.99	1.05	4.50
1.00	9.00	4.00	1.00	2.00	1.00	1.00	1.04	1.57	7.11	7.11	5.44	1.57	2.62	5.12	3.55	-0.51	1.32	3.00
2.00	10.00	4.00	1.00	2.00	1.00	2.00	0.73	1.57	7.11	7.11	4.18	1.96	2.65	5.42	4.06	0.20	1.41	3.00
95.00	11.00	4.00	1.00	2.00	1.00	3.00	0.65	0.54	5.03	6.29	0.00	1.97	1.71	5.40	3.11	-0.27	1.11	3.00
96.00	12.00	4.00	1.00	2.00	1.00	4.00	1.35	0.70	2.52	6.29	0.00	1.97	1.64	5.85	3.21	-0.55	1.05	3.00
19.00	13.00	4.00	1.00	2.00	2.00	1.00	0.99	1.04	2.93	5.44	0.00	1.63	2.94	6.52	3.19	1.48	1.73	5.00
20.00	14.00	4.00	1.00	2.00	2.00	2.00	0.73	1.20	4.18	5.44	0.00	1.96	2.29	6.02	3.19	1.53	1.61	5.00
77.00	15.00	4.00	1.00	2.00	2.00	3.00	1.62	0.86	1.68	6.29	0.00	2.57	2.93	6.98	2.90	0.66	1.10	3.50
78.00	16.00	4.00	1.00	2.00	2.00	4.00	0.97	0.43	2.10	5.87	0.00	2.07	1.05	7.65	3.21	2.20	1.38	3.50
39.00	17.00	4.00	1.00	3.00	1.00	1.00	0.73	1.30	0.00	3.35	0.00	0.62	1.60	5.02	1.17	3.21	1.74	3.00
40.00	18.00	4.00	1.00	3.00	1.00	2.00	1.10	1.46	0.00	2.93	0.00	0.65	1.50	6.72	1.72	3.83	1.76	3.00
57.00	19.00	4.00	1.00	3.00	1.00	3.00	0.63	1.04	0.00	5.02	0.00	1.41	1.73	4.91	2.03	3.57	1.64	3.00
58.00	20.00	4.00	1.00	3.00	1.00	4.00	0.78	1.41	0.00	3.35	0.00	0.98	1.05	6.52	1.62	3.67	1.71	3.00
23.00	21.00	4.00	1.00	3.00	2.00	1.00	0.94	1.20	0.00	6.28	0.00	1.50	2.49	6.52	1.93	5.00	2.07	3.00
24.00	22.00	4.00	1.00	3.00	2.00	2.00	1.04	1.04	0.00	6.28	0.00	1.37	1.86	7.62	1.62	5.41	2.05	3.00
72.00	23.00	4.00	1.00	3.00	2.00	3.00	1.24	0.70	0.00	6.71	0.00	1.78	2.37	8.33	1.71	6.70	1.70	3.50
74.00	24.00	4.00	1.00	3.00	2.00	4.00	1.19	0.65	0.00	5.03	0.00	1.91	2.43	7.99	2.28	5.05	1.50	3.50
37.00	25.00	4.00	2.00	1.00	1.00	1.00	1.15	1.51	3.77	6.69	3.77	1.63	2.49	6.02	4.56	-0.36	1.78	3.00
38.00	26.00	4.00	2.00	1.00	1.00	2.00	1.15	1.62	4.60	9.62	1.26	2.29	2.45	6.02	4.21	0.92	1.52	3.00
59.00	27.00	4.00	2.00	1.00	1.00	3.00	2.35	2.24	3.35	5.86	2.51	2.55	2.84	6.82	5.02	3.67	2.27	5.00
60.00	28.00	4.00	2.00	1.00	1.00	4.00	1.88	2.14	2.93	6.28	0.00	1.96	2.71	5.92	4.97	2.04	1.81	5.00
29.00	29.00	4.00	2.00	1.00	2.00	1.00	1.83	0.78	5.02	5.86	1.26	2.71	2.09	5.92	4.21	1.17	1.71	5.00
30.00	30.00	4.00	2.00	1.00	2.00	2.00	1.57	0.63	5.02	5.44	2.51	1.73	2.62	6.02	4.26	0.41	1.59	5.00
67.00	31.00	4.00	2.00	1.00	2.00	3.00	2.16	0.54	2.94	6.71	0.00	2.53	2.50	8.10	4.77	1.21	1.55	4.00
68.00	32.00	4.00	2.00	1.00	2.00	4.00	2.16	1.08	3.78	6.71	1.26	2.04	1.32	7.20	4.56	1.26	1.35	4.00
47.00	33.00	4.00	2.00	2.00	1.00	1.00	0.63	0.78	4.18	5.44	0.00	1.08	2.13	6.02	3.45	-0.71	1.50	4.00
48.00	34.00	4.00	2.00	2.00	1.00	2.00	1.04	1.46	3.35	5.44	0.00	2.39	2.22	6.02	4.46	1.28	1.66	4.00
49.00	35.00	4.00	2.00	2.00	1.00	3.00	0.63	1.72	1.26	5.02	0.00	1.63	2.42	5.22	4.06	2.14	1.69	4.00
50.00	36.00	4.00	2.00	2.00	1.00	4.00	0.63	1.20	2.93	5.02	0.00	1.18	1.99	5.22	3.80	0.26	1.61	4.00
17.00	37.00	4.00	2.00	2.00	2.00	1.00	0.84	1.15	3.35	7.11	0.00	1.37	2.45	6.02	4.87	1.12	1.64	5.00
18.00	38.00	4.00	2.00	2.00	2.00	2.00	1.20	0.94	3.35	5.86	0.00	1.47	2.45	6.62	5.48	2.40	1.78	5.00
79.00	39.00	4.00	2.00	2.00	2.00	3.00	1.89	0.54	2.52	7.13	0.00	1.58	1.64	6.53	5.55	1.87	1.23	4.00
80.00	40.00	4.00	2.00	2.00	2.00	4.00	1.40	0.43	2.10	7.13	0.00	1.48	0.99	5.63	4.87	3.30	1.19	4.00
25.00	41.00	4.00	2.00	3.00	1.00	1.00	0.89	2.09	0.00	5.02	0.00	0.33	1.96	3.21	5.17	3.73	1.81	3.00
26.00	42.00	4.00	2.00	3.00	1.00	2.00	0.68	1.57	0.00	5.02	0.00	0.88	2.03	2.71	3.30	3.88	1.64	3.00
71.00	43.00	4.00	2.00	3.00	1.00	3.00	1.19	1.13	0.00	5.03	0.00	1.68	1.58	6.53	4.87	4.78	1.23	3.00
72.00	44.00	4.00	2.00	3.00	1.00	4.00	1.62	1.08	0.00	5.03	0.00	1.58	1.15	5.74	6.12	4.89	1.31	3.00
35.00	45.00	4.00	2.00	3.00	2.00	1.00	1.30	1.57	0.00	6.28	0.00	1.57	2.29	6.32	5.07	5.26	1.97	3.00
36.00	46.00	4.00	2.00	3.00	2.00	2.00	1.30	1.83	0.00	5.44	0.00	1.21	2.55	5.22	5.17	6.48	1.97	3.00
61.00	47.00	4.00	2.00	3.00	2.00	3.00	1.46	1.30	0.00	7.11	0.00	1.05	2.06	5.82	5.12	5.87	1.92	4.00
62.00	48.00	4.00	2.00	3.00	2.00	4.00	1.57	2.51	0.00	6.28	0.00	0.85	1.31	7.02	4.67	6.63	2.14	4.00

LIFT	SEQ #	SUB	ANGLE	HT	VOL	TRIAL	LF(A)	LF(B)	VF(A)	VF(B)	VF(C)	FF(A)	FF(B)	ST(A)	CT(A)	CT(B)	TT(B)	VOTE
13.00	49.00	4.00	3.00	1.00	1.00	1.00	0.68	1.72	2.51	5.44	0.00	1.70	1.63	6.82	6.19	1.99	1.97	5.00
14.00	50.00	4.00	3.00	1.00	1.00	2.00	2.09	1.57	2.93	5.44	0.00	1.90	1.86	6.32	5.68	1.28	1.64	5.00
83.00	51.00	4.00	3.00	1.00	1.00	3.00	1.62	1.08	2.52	6.29	0.00	2.37	2.76	5.97	6.64	2.42	1.25	4.50
84.00	52.00	4.00	3.00	1.00	1.00	4.00	2.32	1.24	4.61	5.45	0.00	2.93	1.18	6.53	6.43	2.36	1.40	4.50
43.00	53.00	4.00	3.00	1.00	2.00	1.00	2.30	1.88	5.02	6.69	2.51	2.32	3.01	5.72	5.43	1.53	1.78	5.00
44.00	54.00	4.00	3.00	1.00	2.00	2.00	1.72	1.83	2.93	6.28	0.00	1.31	1.96	4.91	7.05	0.92	1.86	5.00
53.00	55.00	4.00	3.00	1.00	2.00	3.00	2.35	2.09	4.18	6.69	0.00	1.54	2.88	5.42	6.14	0.92	1.78	4.50
54.00	56.00	4.00	3.00	1.00	2.00	4.00	1.51	2.04	6.28	5.86	0.00	1.57	2.78	6.22	5.68	1.89	1.94	4.50
15.00	57.00	4.00	3.00	2.00	1.00	1.00	0.94	1.20	7.53	7.11	2.09	1.44	3.04	4.31	5.58	0.66	1.64	3.50
16.00	58.00	4.00	3.00	2.00	1.00	2.00	0.99	1.04	4.18	5.02	0.00	0.75	2.09	5.12	5.68	2.19	1.69	3.50
91.00	59.00	4.00	3.00	2.00	1.00	3.00	0.75	0.92	2.94	5.45	0.00	1.41	2.04	5.85	5.18	2.31	1.35	3.50
92.00	60.00	4.00	3.00	2.00	1.00	4.00	0.49	0.75	2.52	5.87	0.00	1.38	2.04	5.40	5.29	1.54	1.02	3.50
45.00	61.00	4.00	3.00	2.00	2.00	1.00	1.20	1.93	3.77	9.20	0.00	1.47	2.32	5.12	6.39	3.06	1.94	5.00
46.00	62.00	4.00	3.00	2.00	2.00	2.00	1.30	1.77	3.35	7.95	0.00	1.01	1.90	6.02	6.39	3.78	1.97	5.00
51.00	63.00	4.00	3.00	2.00	2.00	3.00	1.57	1.72	2.51	5.44	0.00	0.59	1.96	4.31	6.49	3.57	1.97	5.00
52.00	64.00	4.00	3.00	2.00	2.00	4.00	1.20	1.20	2.51	6.28	0.00	1.34	2.13	4.81	6.24	2.70	1.84	5.00
5.00	65.00	4.00	3.00	3.00	1.00	1.00	1.25	2.30	1.26	6.28	0.00	0.85	1.96	3.31	7.56	3.06	1.53	3.00
6.00	66.00	4.00	3.00	3.00	1.00	2.00	1.10	2.09	0.00	6.28	0.00	0.13	1.54	3.01	7.71	2.96	1.32	3.00
91.00	67.00	4.00	3.00	3.00	1.00	3.00	1.19	1.78	0.00	5.87	0.00	1.02	1.41	4.73	7.83	3.52	1.05	3.00
92.00	68.00	4.00	3.00	3.00	1.00	4.00	1.62	1.29	0.00	5.87	0.00	0.92	1.05	3.60	7.88	5.49	1.17	3.00
21.00	69.00	4.00	3.00	3.00	2.00	1.00	1.04	1.77	0.00	8.37	0.00	0.16	2.26	4.31	7.05	4.08	1.74	3.50
22.00	70.00	4.00	3.00	3.00	2.00	2.00	1.04	1.51	0.00	7.53	0.00	0.33	2.13	4.41	7.61	4.95	2.01	3.50
75.00	71.00	4.00	3.00	3.00	2.00	3.00	1.19	2.05	0.00	7.55	0.00	0.66	1.91	5.51	8.40	4.61	1.14	3.50
76.00	72.00	4.00	3.00	3.00	2.00	4.00	1.19	1.19	0.00	6.71	0.00	1.18	1.51	6.53	8.14	5.82	1.56	3.50
3.00	73.00	4.00	4.00	1.00	1.00	1.00	0.52	2.30	10.88	8.37	6.69	2.52	2.35	6.32	5.48	2.35	1.81	4.50
4.00	74.00	4.00	4.00	1.00	1.00	2.00	1.57	3.39	6.28	7.95	6.28	2.52	3.04	6.02	7.10	1.94	1.69	4.50
93.00	75.00	4.00	4.00	1.00	1.00	3.00	1.19	2.16	3.36	5.87	0.00	1.68	2.30	5.97	7.67	2.09	1.08	5.00
94.00	76.00	4.00	4.00	1.00	1.00	4.00	1.72	1.78	1.26	5.45	0.00	2.14	1.91	6.30	5.70	1.65	1.40	5.00
31.00	77.00	4.00	4.00	1.00	2.00	1.00	0.89	1.30	4.60	6.28	0.00	1.63	2.65	5.92	6.09	1.63	1.59	5.50
32.00	78.00	4.00	4.00	1.00	2.00	2.00	1.04	1.30	2.93	6.69	0.00	1.37	2.39	5.32	6.44	1.12	2.04	5.50
65.00	79.00	4.00	4.00	1.00	2.00	3.00	2.26	2.48	4.19	6.29	0.00	1.15	2.04	7.43	6.84	2.97	1.56	5.00
66.00	80.00	4.00	4.00	1.00	2.00	4.00	1.08	1.08	2.94	6.29	0.00	1.97	2.07	6.53	5.39	2.64	1.71	5.00
41.00	81.00	4.00	4.00	2.00	1.00	1.00	0.57	2.24	2.51	5.44	0.00	0.65	2.19	5.02	6.03	1.94	1.63	4.50
42.00	82.00	4.00	4.00	2.00	1.00	2.00	0.42	1.57	2.09	7.11	0.00	1.80	2.22	4.11	5.02	2.04	1.58	4.50
55.00	83.00	4.00	4.00	2.00	1.00	3.00	0.21	1.57	2.51	5.44	0.00	1.63	2.29	4.21	4.67	2.45	1.71	4.00
56.00	84.00	4.00	4.00	2.00	1.00	4.00	0.31	1.57	1.67	5.86	0.00	0.72	1.34	3.11	5.48	1.68	1.46	4.00
11.00	85.00	4.00	4.00	2.00	2.00	1.00	0.47	1.67	7.53	10.46	2.09	1.47	2.29	5.32	6.09	2.14	1.68	4.50
12.00	86.00	4.00	4.00	2.00	2.00	2.00	0.52	1.36	3.77	10.46	1.26	0.43	2.29	5.72	6.64	3.47	1.68	4.50
85.00	87.00	4.00	4.00	2.00	2.00	3.00	0.54	1.51	2.52	7.55	0.00	1.41	1.64	5.06	7.10	2.09	1.02	5.00
86.00	88.00	4.00	4.00	2.00	2.00	4.00	0.49	1.08	1.68	7.57	0.00	0.69	2.99	4.29	6.84	3.08	1.26	5.00
7.00	89.00	4.00	4.00	3.00	1.00	1.00	0.52	2.30	0.00	5.44	0.00	0.00	2.03	1.00	7.35	2.96	1.25	3.00
8.00	90.00	4.00	4.00	3.00	1.00	2.00	0.63	2.19	0.00	5.86	0.00	0.00	1.31	2.21	7.20	2.45	1.15	3.00
89.00	91.00	4.00	4.00	3.00	1.00	3.00	0.54	2.16	0.00	6.29	0.00	0.07	1.38	1.24	7.36	3.41	0.95	3.50
90.00	92.00	4.00	4.00	3.00	1.00	4.00	1.19	1.08	0.00	5.45	0.00	0.33	1.05	2.36	7.62	3.68	0.98	3.50
33.00	93.00	4.00	4.00	3.00	2.00	1.00	0.89	2.04	0.00	7.53	0.00	0.10	2.62	2.81	7.51	3.21	1.45	3.50
34.00	94.00	4.00	4.00	3.00	2.00	2.00	0.89	2.87	0.00	7.53	0.00	0.59	3.04	5.02	7.76	5.15	1.71	3.50
63.00	95.00	4.00	4.00	3.00	2.00	3.00	0.84	2.09	0.00	9.20	0.00	0.65	1.96	4.71	7.81	6.53	1.61	4.50
64.00	96.00	4.00	4.00	3.00	2.00	4.00	1.04	2.40	0.84	9.62	0.00	0.88	1.70	4.21	8.22	6.28	1.68	4.50

LIFT	SEQ #	SUB	ANGLE	HT	VOL	TRIAL	LF(A)	LF(B)	VF(A)	VF(B)	VF(C)	FF(A)	FF(B)	ST(A)	CT(A)	CT(B)	TT(B)	VOTE
1.00	1.00	5.00	1.00	1.00	1.00	1.00	2.21	1.24	12.86	15.44	13.72	1.73	4.51	6.81	5.29	0.96	1.27	2.00
2.00	2.00	5.00	1.00	1.00	1.00	2.00	1.67	1.56	11.15	13.72	15.44	1.80	1.96	5.71	4.15	0.27	1.36	2.60
55.00	3.00	5.00	1.00	1.00	1.00	3.00	1.71	1.29	12.64	8.43	9.69	2.93	3.88	6.44	5.78	2.06	1.07	2.00
56.00	4.00	5.00	1.00	1.00	1.00	4.00	2.48	1.14	8.43	11.80	9.27	2.90	2.86	6.76	4.88	1.79	0.98	2.00
25.00	5.00	5.00	1.00	1.00	2.00	1.00	1.72	1.13	10.29	8.58	8.15	3.99	4.15	8.13	5.29	-0.11	1.33	2.80
26.00	6.00	5.00	1.00	1.00	2.00	2.00	3.40	1.78	8.58	12.86	9.43	1.86	4.77	6.48	5.86	0.64	1.31	2.80
71.00	7.00	5.00	1.00	1.00	2.00	3.00	2.33	1.34	8.43	13.91	7.16	4.05	4.93	5.90	5.04	-0.54	0.91	2.90
72.00	8.00	5.00	1.00	1.00	2.00	4.00	1.86	1.29	6.32	7.16	7.16	3.32	3.95	7.19	4.24	-0.11	0.94	2.90
15.00	9.00	5.00	1.00	2.00	1.00	1.00	1.08	1.51	13.72	12.86	7.72	2.22	1.80	4.62	6.22	1.06	1.02	2.00
16.00	10.00	5.00	1.00	2.00	1.00	2.00	0.49	1.35	9.86	11.58	15.44	1.77	2.65	5.93	6.38	1.06	0.95	2.00
81.00	11.00	5.00	1.00	2.00	1.00	3.00	1.24	1.19	7.59	4.21	5.06	2.90	1.97	7.73	3.82	0.38	0.98	2.90
82.00	12.00	5.00	1.00	2.00	1.00	4.00	1.03	0.47	8.43	5.90	7.59	2.07	1.74	6.65	3.34	0.16	1.02	2.90
23.00	13.00	5.00	1.00	2.00	2.00	1.00	1.56	0.92	12.86	9.86	11.58	1.37	2.06	5.82	4.15	0.00	1.46	3.00
24.00	14.00	5.00	1.00	2.00	2.00	2.00	0.54	1.24	8.58	9.43	15.87	1.77	1.96	5.82	4.25	0.48	1.44	3.00
73.00	15.00	5.00	1.00	2.00	2.00	3.00	1.55	1.29	7.16	6.32	2.95	1.91	2.07	6.76	4.19	1.19	1.35	2.90
74.00	16.00	5.00	1.00	2.00	2.00	4.00	1.45	0.72	5.90	6.32	4.21	2.30	2.30	6.76	3.87	0.16	1.30	2.90
33.00	17.00	5.00	1.00	3.00	1.00	1.00	0.70	0.49	0.86	5.15	0.00	1.37	0.85	7.14	0.00	4.35	1.70	1.00
34.00	18.00	5.00	1.00	3.00	1.00	2.00	0.59	0.54	0.86	5.15	0.00	1.31	1.31	6.92	0.41	4.41	1.73	1.00
63.00	19.00	5.00	1.00	3.00	1.00	3.00	0.86	0.54	0.00	4.72	0.00	1.21	0.72	7.69	0.62	4.35	1.58	1.00
64.00	20.00	5.00	1.00	3.00	1.00	4.00	1.08	0.65	0.00	4.29	0.00	1.31	0.88	7.69	1.14	3.88	1.50	1.00
13.00	21.00	5.00	1.00	3.00	2.00	1.00	1.62	0.97	1.29	5.57	0.00	2.65	1.28	8.02	2.59	3.29	1.56	1.90
14.00	22.00	5.00	1.00	3.00	2.00	2.00	1.08	1.24	1.29	5.57	0.00	1.63	1.77	7.69	2.55	6.48	2.01	1.90
83.00	23.00	5.00	1.00	3.00	2.00	3.00	1.24	0.57	0.00	5.06	0.00	2.53	0.72	8.58	1.75	4.02	1.51	2.30
84.00	24.00	5.00	1.00	3.00	2.00	4.00	1.60	0.72	0.00	5.06	0.00	1.64	0.99	8.37	2.97	6.68	1.76	2.30
29.00	25.00	5.00	2.00	1.00	1.00	1.00	2.86	1.19	9.43	12.01	13.72	2.45	3.70	7.47	6.43	-0.16	1.61	2.00
30.00	26.00	5.00	2.00	1.00	1.00	2.00	3.40	1.08	12.86	16.29	14.15	2.45	4.09	6.70	6.95	1.06	1.24	2.00
67.00	27.00	5.00	2.00	1.00	1.00	3.00	2.58	1.55	7.59	11.80	7.16	2.07	2.40	5.58	6.52	1.19	1.46	2.80
68.00	28.00	5.00	2.00	1.00	1.00	4.00	3.26	1.65	7.59	8.85	10.53	2.57	3.06	6.76	6.47	1.19	1.27	2.80
47.00	29.00	5.00	2.00	1.00	2.00	1.00	2.10	1.67	8.58	10.72	6.86	2.45	2.94	6.70	6.17	0.53	1.87	2.50
48.00	30.00	5.00	2.00	1.00	2.00	2.00	2.16	1.24	11.15	10.29	8.58	4.41	3.70	6.81	6.12	2.02	2.07	2.50
49.00	31.00	5.00	2.00	1.00	2.00	3.00	3.13	1.51	9.00	12.86	9.00	1.67	4.19	6.92	5.18	0.00	1.72	2.20
50.00	32.00	5.00	2.00	1.00	2.00	4.00	3.07	1.19	9.43	9.86	9.43	1.83	4.25	5.71	5.18	0.32	1.63	2.20
21.00	33.00	5.00	2.00	2.00	1.00	1.00	0.32	1.24	12.01	11.15	13.72	1.31	2.29	5.39	4.82	1.96	1.19	2.70
22.00	34.00	5.00	2.00	2.00	1.00	2.00	1.08	1.78	10.72	8.58	11.58	1.01	1.50	5.28	4.82	1.59	1.29	2.70
75.00	35.00	5.00	2.00	2.00	1.00	3.00	0.67	1.19	6.74	6.74	3.79	1.84	3.32	5.58	4.56	-0.11	1.22	3.00
76.00	36.00	5.00	2.00	2.00	1.00	4.00	2.07	2.33	9.69	6.32	7.59	1.81	2.63	5.69	4.99	0.54	1.38	3.00
27.00	37.00	5.00	2.00	2.00	2.00	1.00	1.78	1.62	10.72	10.29	12.01	1.37	2.22	5.71	6.07	1.81	1.82	3.20
28.00	38.00	5.00	2.00	2.00	2.00	2.00	1.08	1.08	9.00	9.86	17.15	1.50	1.73	7.51	5.34	1.86	1.75	3.20
69.00	39.00	5.00	2.00	2.00	2.00	3.00	1.34	1.14	7.16	7.16	2.53	1.25	2.43	4.29	4.56	0.65	1.17	3.00
70.00	40.00	5.00	2.00	2.00	2.00	4.00	1.45	1.40	7.59	5.90	5.06	1.74	2.50	6.22	5.94	1.63	1.53	3.00
19.00	41.00	5.00	2.00	3.00	1.00	1.00	1.35	0.86	1.29	5.15	0.00	1.05	1.24	5.93	3.68	4.25	1.53	1.00
20.00	42.00	5.00	2.00	3.00	1.00	2.00	1.24	1.08	0.86	5.15	0.00	0.75	0.98	5.82	4.30	4.41	1.65	1.00
77.00	43.00	5.00	2.00	3.00	1.00	3.00	1.29	0.52	0.00	5.06	0.00	1.64	0.46	6.12	3.55	4.78	1.45	1.50
78.00	44.00	5.00	2.00	3.00	1.00	4.00	1.19	0.67	0.00	5.06	0.00	1.58	1.22	6.22	4.30	4.51	1.33	1.50
31.00	45.00	5.00	2.00	3.00	2.00	1.00	1.35	1.29	0.86	6.43	0.00	1.34	1.41	5.60	3.53	6.05	1.59	2.00
32.00	46.00	5.00	2.00	3.00	2.00	2.00	1.08	0.92	0.86	6.00	0.00	1.63	1.47	7.14	4.51	6.32	2.04	2.00
65.00	47.00	5.00	2.00	3.00	2.00	3.00	1.71	1.03	0.00	5.48	0.00	2.24	1.64	6.97	5.41	5.05	1.53	2.00
66.00	48.00	5.00	2.00	3.00	2.00	4.00	1.55	1.50	0.00	5.48	0.00	2.07	2.07	5.69	4.35	5.97	1.54	2.00

LIFT	SEQ #	SUB	ANGLE	HT	VOL	TRIAL	LF(A)	LF(B)	VF(A)	VF(B)	VF(C)	FF(A)	FF(B)	ST(A)	CT(A)	CT(B)	TT(B)	VOTE
5.00	49.00	5.00	3.00	1.00	1.00	1.00	1.62	1.72	11.58	14.15	7.29	1.67	3.34	4.84	7.47	1.17	1.67	2.80
6.00	50.00	5.00	3.00	1.00	1.00	2.00	2.69	2.26	9.43	10.29	14.15	3.66	2.94	5.49	7.93	1.06	1.51	2.80
51.00	51.00	5.00	3.00	1.00	1.00	3.00	2.22	1.65	9.69	7.16	4.21	2.40	2.37	5.90	7.05	0.87	1.40	3.00
92.00	52.00	5.00	3.00	1.00	1.00	4.00	3.05	1.50	8.43	6.74	4.21	2.07	2.93	4.61	6.52	0.38	1.11	3.00
35.00	53.00	5.00	3.00	1.00	2.00	1.00	2.16	1.62	13.72	12.86	18.01	2.55	2.68	6.59	7.67	0.96	1.68	3.00
36.00	54.00	5.00	3.00	1.00	2.00	2.00	2.26	1.62	12.01	12.86	15.01	3.60	3.01	6.92	8.14	-0.11	1.70	3.00
61.00	55.00	5.00	3.00	1.00	2.00	3.00	3.40	2.26	11.58	13.72	12.86	3.60	3.30	6.59	7.26	1.43	1.80	3.00
62.00	56.00	5.00	3.00	1.00	2.00	4.00	2.86	1.78	12.01	12.01	9.43	2.98	3.60	5.71	7.41	3.50	1.60	3.00
9.00	57.00	5.00	3.00	2.00	1.00	1.00	0.70	1.78	6.43	9.86	13.72	1.63	1.60	6.81	5.96	1.12	1.67	2.80
10.00	58.00	5.00	3.00	2.00	1.00	2.00	0.54	1.08	8.58	10.29	13.72	1.31	2.09	6.92	6.17	0.85	1.61	2.80
87.00	59.00	5.00	3.00	2.00	1.00	3.00	1.96	0.83	5.06	6.74	3.79	1.71	1.71	6.44	6.47	0.98	1.35	2.90
38.00	60.00	5.00	3.00	2.00	1.00	4.00	1.24	1.86	3.37	7.59	6.74	1.71	2.40	6.22	5.94	1.36	1.51	2.90
41.00	61.00	5.00	3.00	2.00	2.00	1.00	1.62	1.62	5.57	6.00	4.29	1.96	2.22	7.03	5.81	2.23	2.21	3.20
42.00	62.00	5.00	3.00	2.00	2.00	2.00	1.56	1.19	5.15	6.00	10.29	1.34	1.31	7.58	6.22	2.60	1.94	3.20
55.00	63.00	5.00	3.00	2.00	2.00	3.00	2.16	1.51	4.72	6.86	3.86	1.54	1.99	6.92	6.12	3.29	2.21	2.90
56.00	64.00	5.00	3.00	2.00	2.00	4.00	1.72	1.99	4.29	6.43	5.57	1.90	2.09	7.47	5.34	3.08	2.24	2.90
17.00	65.00	5.00	3.00	3.00	1.00	1.00	1.08	1.83	0.00	5.15	0.00	1.21	1.14	6.59	7.26	4.94	1.75	1.00
18.00	66.00	5.00	3.00	3.00	1.00	2.00	1.08	1.51	0.86	5.57	0.00	1.34	2.71	4.73	7.00	4.99	1.53	1.00
79.00	67.00	5.00	3.00	3.00	1.00	3.00	1.60	1.03	0.00	5.06	0.00	1.71	1.02	5.36	7.11	5.48	1.51	1.70
80.00	68.00	5.00	3.00	3.00	1.00	4.00	1.40	1.03	0.00	5.06	0.00	0.92	1.05	4.51	7.32	5.10	1.27	1.70
3.00	69.00	5.00	3.00	3.00	2.00	1.00	1.40	1.08	12.86	7.72	0.00	1.24	1.90	5.28	7.67	5.31	1.73	1.80
4.00	70.00	5.00	3.00	3.00	2.00	2.00	0.86	1.19	12.86	7.72	0.00	1.14	1.41	4.84	7.78	6.32	1.78	1.80
93.00	71.00	5.00	3.00	3.00	2.00	3.00	1.55	1.65	0.00	7.59	0.00	1.51	1.35	6.33	7.58	5.97	1.74	1.70
94.00	72.00	5.00	3.00	3.00	2.00	4.00	1.60	1.24	0.00	5.90	0.00	1.64	1.55	6.44	7.64	6.41	1.53	1.70
7.00	73.00	5.00	4.00	1.00	1.00	1.00	0.16	2.16	8.58	10.72	8.58	4.32	2.94	5.82	6.38	1.81	1.80	3.00
8.00	74.00	5.00	4.00	1.00	1.00	2.00	1.29	1.51	7.29	11.15	11.15	2.09	2.88	6.81	8.14	1.59	1.87	3.00
89.00	75.00	5.00	4.00	1.00	1.00	3.00	1.60	1.19	9.69	7.16	9.69	1.97	2.96	4.61	6.79	0.87	1.30	3.20
90.00	76.00	5.00	4.00	1.00	1.00	4.00	1.03	1.45	5.90	7.59	6.32	2.40	2.76	4.51	8.75	1.79	1.17	3.20
39.00	77.00	5.00	4.00	1.00	2.00	1.00	1.78	1.94	5.57	10.29	5.57	2.68	4.25	5.82	6.74	1.49	1.67	3.60
40.00	78.00	5.00	4.00	1.00	2.00	2.00	2.69	2.69	6.43	9.00	6.43	3.07	3.24	6.92	8.40	1.91	1.75	3.60
57.00	79.00	5.00	4.00	1.00	2.00	3.00	2.32	2.75	0.86	10.29	7.72	2.03	3.60	4.73	7.78	1.38	1.50	3.10
58.00	80.00	5.00	4.00	1.00	2.00	4.00	2.86	2.91	0.86	8.58	9.43	3.60	4.25	6.37	7.88	0.96	1.87	3.10
11.00	81.00	5.00	4.00	2.00	1.00	1.00	0.27	1.62	7.72	6.86	8.58	1.57	1.63	5.49	5.86	2.76	1.68	3.00
12.00	82.00	5.00	4.00	2.00	1.00	2.00	1.89	2.05	9.43	10.29	9.43	1.63	2.35	5.82	5.70	2.81	1.82	3.00
85.00	83.00	5.00	4.00	2.00	1.00	3.00	1.65	1.24	7.59	6.32	4.64	1.32	1.71	5.36	6.84	2.71	1.41	3.00
86.00	84.00	5.00	4.00	2.00	1.00	4.00	2.89	1.65	6.32	7.16	3.79	1.74	2.63	5.36	6.21	2.33	1.30	3.00
37.00	85.00	5.00	4.00	2.00	2.00	1.00	1.62	2.26	7.72	10.29	6.43	1.14	2.68	6.15	7.36	2.97	1.84	3.30
38.00	86.00	5.00	4.00	2.00	2.00	2.00	1.78	1.29	5.57	6.00	5.15	1.31	1.70	6.92	6.69	3.13	2.07	3.30
59.00	87.00	5.00	4.00	2.00	2.00	3.00	1.29	1.35	4.72	7.29	5.15	1.86	2.62	7.80	5.70	4.51	2.16	3.40
60.00	88.00	5.00	4.00	2.00	2.00	4.00	1.89	1.08	5.15	8.15	4.29	1.70	2.29	5.82	6.84	4.25	2.18	3.40
43.00	89.00	5.00	4.00	3.00	1.00	1.00	1.19	2.05	1.29	6.43	0.00	0.98	1.34	4.40	7.78	5.26	1.53	1.80
44.00	90.00	5.00	4.00	3.00	1.00	2.00	0.86	1.78	1.29	6.00	0.00	0.65	1.31	4.73	7.41	4.89	1.36	1.80
53.00	91.00	5.00	4.00	3.00	1.00	3.00	0.92	1.78	1.29	5.15	0.00	0.85	0.92	4.73	8.50	6.80	1.73	1.80
54.00	92.00	5.00	4.00	3.00	1.00	4.00	0.81	2.10	1.29	5.15	0.00	0.65	1.31	4.73	7.98	7.43	1.68	1.80
45.00	93.00	5.00	4.00	3.00	2.00	1.00	1.67	1.78	1.29	8.58	0.00	1.21	1.08	4.84	8.71	7.17	1.56	2.00
46.00	94.00	5.00	4.00	3.00	2.00	2.00	1.29	1.51	0.86	7.29	0.00	1.50	1.63	5.60	8.09	6.53	1.72	2.00
51.00	95.00	5.00	4.00	3.00	2.00	3.00	1.78	2.48	0.00	7.29	0.00	1.14	1.31	6.37	8.30	6.90	2.01	2.00
52.00	96.00	5.00	4.00	3.00	2.00	4.00	1.35	1.24	0.00	7.29	0.00	1.31	1.63	6.70	7.47	7.59	1.72	2.00

LIFT	SEQ #	SUB	ANGLE	HT	VOL	TRIAL	LF(A)	LF(B)	VF(A)	VF(B)	VF(C)	FF(A)	FF(B)	ST(A)	CT(A)	CT(B)	TT(B)	VOTE
11.00	1.00	6.00	1.00	1.00	1.00	1.00	1.40	0.97	3.43	4.72	1.72	2.88	2.78	7.91	2.96	2.28	1.16	1.50
12.00	2.00	6.00	1.00	1.00	1.00	2.00	1.62	1.08	3.43	4.72	1.29	2.49	1.57	8.57	2.90	2.23	1.19	1.50
85.00	3.00	6.00	1.00	1.00	1.00	3.00	1.62	0.59	7.13	7.13	3.78	2.90	2.34	8.78	3.01	1.43	1.04	1.50
86.00	4.00	6.00	1.00	1.00	1.00	4.00	0.97	0.92	7.55	6.71	3.78	2.04	1.35	8.10	3.11	1.26	0.92	1.50
9.00	5.00	6.00	1.00	1.00	2.00	1.00	1.62	1.62	2.57	6.43	0.00	2.29	1.96	8.57	2.70	3.03	1.87	2.00
10.00	6.00	6.00	1.00	1.00	2.00	2.00	2.43	1.35	3.43	6.43	0.00	2.26	2.49	9.01	3.73	1.86	1.55	2.00
87.00	7.00	6.00	1.00	1.00	2.00	3.00	1.24	0.65	7.57	8.81	3.36	3.29	2.90	9.12	3.79	2.86	1.23	2.00
88.00	8.00	6.00	1.00	1.00	2.00	4.00	1.62	0.70	7.97	7.55	3.36	2.11	1.58	8.89	3.63	2.86	1.08	2.00
19.00	9.00	6.00	1.00	2.00	1.00	1.00	0.81	0.59	3.00	5.15	0.00	1.67	1.73	8.13	2.85	1.70	1.22	1.50
20.00	10.00	6.00	1.00	2.00	1.00	2.00	1.13	0.54	5.15	5.15	0.00	1.70	1.86	7.69	2.96	1.49	1.19	1.50
77.00	11.00	6.00	1.00	2.00	1.00	3.00	1.62	0.59	7.55	5.87	1.26	1.97	1.74	10.02	3.11	1.21	0.95	2.00
74.00	12.00	6.00	1.00	2.00	1.00	4.00	1.83	0.05	5.03	7.13	2.52	1.64	2.17	9.00	3.84	1.54	0.83	2.00
21.00	13.00	6.00	1.00	2.00	2.00	1.00	0.81	0.70	2.14	5.15	0.00	1.86	1.63	10.44	2.85	4.89	1.67	2.00
22.00	14.00	6.00	1.00	2.00	2.00	2.00	1.19	0.81	3.00	5.15	0.00	1.93	2.29	9.23	3.21	5.26	1.67	2.00
75.00	15.00	6.00	1.00	2.00	2.00	3.00	1.08	0.70	5.45	8.81	2.10	2.83	1.68	10.47	2.07	4.28	1.50	2.50
76.00	16.00	6.00	1.00	2.00	2.00	4.00	1.19	0.11	4.19	9.23	2.10	2.27	1.91	11.48	3.79	3.85	1.35	2.50
37.00	17.00	6.00	1.00	3.00	1.00	1.00	0.49	0.70	0.00	5.15	0.00	1.63	1.60	7.69	2.49	4.25	1.22	1.00
38.00	18.00	6.00	1.00	3.00	1.00	2.00	0.49	0.59	0.00	5.15	0.00	1.08	1.41	7.25	2.07	3.61	1.07	1.00
59.00	19.00	6.00	1.00	3.00	1.00	3.00	0.92	0.65	0.00	5.15	0.00	0.98	1.28	7.58	2.54	3.50	1.24	1.00
60.00	20.00	6.00	1.00	3.00	1.00	4.00	0.54	0.75	0.00	5.15	0.00	1.01	1.63	5.82	2.19	3.08	1.14	1.00
25.00	21.00	6.00	1.00	3.00	2.00	1.00	0.65	0.49	0.00	5.57	0.00	1.60	1.08	10.88	2.07	5.58	1.65	1.50
26.00	22.00	6.00	1.00	3.00	2.00	2.00	0.65	0.54	0.00	5.57	0.00	1.73	2.09	8.24	2.75	6.27	1.60	1.50
71.00	23.00	6.00	1.00	3.00	2.00	3.00	0.54	0.11	0.00	7.13	0.00	1.64	1.28	9.68	3.21	4.83	1.25	1.50
72.00	24.00	6.00	1.00	3.00	2.00	4.00	1.08	0.05	0.00	7.13	0.00	1.64	1.12	9.57	2.28	6.59	1.32	1.50
17.00	25.00	6.00	2.00	1.00	1.00	1.00	1.56	1.08	3.43	5.15	1.29	3.20	2.62	8.79	3.27	2.65	1.58	1.50
18.00	26.00	6.00	2.00	1.00	1.00	2.00	2.37	0.81	3.43	5.15	3.43	2.52	2.94	9.23	3.27	3.93	1.36	1.50
79.00	27.00	6.00	2.00	1.00	1.00	3.00	1.19	1.46	6.29	6.71	2.94	2.76	2.24	7.65	3.89	2.36	1.23	2.00
80.00	28.00	6.00	2.00	1.00	1.00	4.00	1.62	1.56	5.03	7.13	2.52	1.71	1.64	6.98	4.61	2.31	1.11	2.00
15.00	29.00	6.00	2.00	1.00	2.00	1.00	2.75	1.19	3.00	6.43	0.00	2.84	2.88	10.99	3.73	4.04	1.70	2.50
16.00	30.00	6.00	2.00	1.00	2.00	2.00	2.05	1.02	3.43	5.57	1.29	3.37	2.29	10.22	3.11	3.19	1.53	2.50
81.00	31.00	6.00	2.00	1.00	2.00	3.00	2.21	1.56	6.71	11.75	2.10	2.70	2.63	9.34	3.63	4.28	1.64	3.00
82.00	32.00	6.00	2.00	1.00	2.00	4.00	1.62	0.65	6.29	8.81	2.10	1.91	1.32	9.23	4.25	3.74	1.70	3.00
33.00	33.00	6.00	2.00	2.00	1.00	1.00	1.08	1.08	2.57	5.15	0.00	1.60	2.32	8.57	5.81	2.34	1.22	2.50
34.00	34.00	6.00	2.00	2.00	1.00	2.00	1.08	1.08	5.57	5.15	0.00	1.18	1.67	9.01	5.08	2.87	1.39	2.50
63.00	35.00	6.00	2.00	2.00	1.00	3.00	1.35	1.08	3.00	5.15	1.29	1.47	2.55	9.45	6.01	3.72	1.48	2.00
64.00	36.00	6.00	2.00	2.00	1.00	4.00	1.35	1.08	3.43	5.15	0.00	1.63	1.67	8.90	5.29	4.94	1.61	2.00
43.00	37.00	6.00	2.00	2.00	2.00	1.00	1.08	1.29	1.29	5.57	0.00	1.63	1.96	9.23	5.86	5.20	1.70	2.80
44.00	38.00	6.00	2.00	2.00	2.00	2.00	1.78	1.13	2.14	5.15	0.00	1.96	1.93	10.77	6.12	6.58	2.07	2.80
53.00	39.00	6.00	2.00	2.00	2.00	3.00	1.13	1.19	4.29	7.72	0.00	2.35	1.60	10.88	5.86	6.37	1.77	3.00
54.00	40.00	6.00	2.00	2.00	2.00	4.00	1.56	1.51	3.86	7.29	0.00	2.26	1.99	9.23	5.70	7.22	1.75	3.00
7.00	41.00	6.00	2.00	3.00	1.00	1.00	0.81	2.10	0.00	5.57	0.00	1.08	1.47	5.39	4.41	4.78	1.36	1.00
8.00	42.00	6.00	2.00	3.00	1.00	2.00	0.27	1.67	0.00	5.57	0.00	0.75	1.63	5.49	4.20	3.61	1.07	1.00
89.00	43.00	6.00	2.00	3.00	1.00	3.00	1.08	1.46	0.00	5.45	0.00	1.35	1.15	6.19	3.84	6.21	1.20	1.00
90.00	44.00	6.00	2.00	3.00	1.00	4.00	1.08	1.02	0.00	5.45	0.00	1.51	0.92	7.54	4.15	4.94	1.01	1.00
13.00	45.00	6.00	2.00	3.00	2.00	1.00	1.08	1.19	0.00	6.00	0.00	1.60	1.90	8.57	4.30	6.00	1.53	1.00
14.00	46.00	6.00	2.00	3.00	2.00	2.00	1.08	1.94	0.00	6.00	0.00	1.83	1.73	8.57	5.18	6.90	1.56	1.00
83.00	47.00	6.00	2.00	3.00	2.00	3.00	1.08	0.54	0.00	7.13	0.00	1.64	1.55	9.00	4.25	7.85	1.49	1.50
84.00	48.00	6.00	2.00	3.00	2.00	4.00	1.51	1.02	0.00	6.71	0.00	1.71	1.51	10.35	5.39	8.51	1.52	1.50

LIFT	SEQ #	SUB	ANGLE	HT	VOL	TRIAL	LF(A)	LF(B)	VF(A)	VF(B)	VF(C)	FF(A)	FF(B)	ST(A)	CT(A)	CT(B)	TT(B)	VOTE
27.00	49.00	6.00	3.00	1.00	1.00	1.00	1.62	1.46	5.15	5.57	3.43	2.42	2.71	9.56	3.73	3.88	1.48	3.00
28.00	50.00	6.00	3.00	1.00	1.00	2.00	1.51	1.19	4.29	5.57	4.29	3.04	2.94	10.11	4.36	3.19	1.46	3.00
69.00	51.00	6.00	3.00	1.00	1.00	3.00	2.16	0.81	7.13	7.55	3.36	2.37	2.73	8.22	4.51	4.01	1.58	2.00
70.00	52.00	6.00	3.00	1.00	1.00	4.00	2.16	0.16	6.29	7.13	3.78	2.11	2.96	7.88	5.81	3.85	1.41	2.00
45.00	53.00	6.00	3.00	1.00	2.00	1.00	1.02	1.35	3.86	6.00	1.29	3.20	3.47	10.22	5.13	5.26	1.94	3.00
46.00	54.00	6.00	3.00	1.00	2.00	2.00	1.78	0.97	5.15	5.57	1.29	3.24	2.55	10.00	4.82	4.89	2.07	3.00
51.00	55.00	6.00	3.00	1.00	2.00	3.00	1.08	1.72	5.15	6.00	0.00	3.04	3.24	10.00	5.55	4.73	2.01	3.00
52.00	56.00	6.00	3.00	1.00	2.00	4.00	1.24	1.19	7.29	6.43	0.00	2.55	2.98	9.23	5.70	4.73	1.90	3.00
39.00	57.00	6.00	3.00	2.00	1.00	1.00	0.70	1.24	2.57	5.15	0.00	1.24	2.81	7.03	6.33	3.19	1.24	1.50
40.00	58.00	6.00	3.00	2.00	1.00	2.00	0.70	1.62	2.14	5.15	0.00	1.24	2.55	8.13	6.33	3.72	1.41	1.50
57.00	59.00	6.00	3.00	2.00	1.00	3.00	0.81	1.35	3.43	5.15	0.00	1.47	1.67	9.12	7.16	5.47	1.73	2.50
58.00	60.00	6.00	3.00	2.00	1.00	4.00	1.51	1.40	3.00	5.15	1.29	1.60	1.83	10.11	7.93	7.01	1.90	2.50
3.00	61.00	6.00	3.00	2.00	2.00	1.00	1.08	1.13	3.43	7.72	0.00	1.73	2.03	7.80	7.67	3.35	1.41	3.50
4.00	62.00	6.00	3.00	2.00	2.00	2.00	1.24	1.35	2.14	7.72	0.00	1.67	1.80	7.91	7.16	4.89	1.67	3.50
93.00	63.00	6.00	3.00	2.00	2.00	3.00	1.40	1.72	4.19	8.39	0.00	2.30	2.07	8.78	7.26	7.25	1.68	3.00
94.00	64.00	6.00	3.00	2.00	2.00	4.00	1.62	1.78	3.36	8.39	0.84	2.04	1.81	10.02	7.26	6.81	1.50	3.00
5.00	65.00	6.00	3.00	3.00	1.00	1.00	0.86	2.16	0.00	5.57	0.00	0.65	1.80	4.62	7.16	4.25	1.33	1.00
6.00	66.00	6.00	3.00	3.00	1.00	2.00	0.54	1.62	0.00	5.57	0.00	1.05	2.09	6.59	6.58	5.47	1.36	1.00
91.00	67.00	6.00	3.00	3.00	1.00	3.00	1.19	2.21	0.00	5.87	0.00	0.76	1.15	6.19	7.78	4.83	1.10	1.00
92.00	68.00	6.00	3.00	3.00	1.00	4.00	1.51	1.62	0.00	5.87	0.00	1.18	1.58	6.98	7.73	6.76	1.17	1.00
35.00	69.00	6.00	3.00	3.00	2.00	1.00	0.65	1.35	0.00	8.58	0.00	1.24	1.86	8.57	7.41	7.27	1.70	2.00
36.00	70.00	6.00	3.00	3.00	2.00	2.00	0.70	0.97	0.00	8.58	0.00	1.63	2.39	8.68	7.98	7.01	1.36	2.00
61.00	71.00	6.00	3.00	3.00	2.00	3.00	0.27	2.48	0.00	7.72	0.00	1.05	1.96	6.15	8.19	7.01	1.56	1.50
62.00	72.00	6.00	3.00	3.00	2.00	4.00	0.59	1.56	0.00	7.72	0.00	1.60	1.86	7.58	7.93	6.37	1.41	1.50
31.00	73.00	6.00	4.00	1.00	1.00	1.00	1.62	1.19	5.15	6.00	4.29	3.24	2.94	8.90	5.03	3.98	1.58	2.50
32.00	74.00	6.00	4.00	1.00	1.00	2.00	1.19	0.81	4.72	6.00	3.43	3.66	1.70	8.90	5.29	3.82	1.51	2.50
65.00	75.00	6.00	4.00	1.00	1.00	3.00	1.08	2.10	5.03	7.55	2.94	2.53	2.66	9.23	5.70	4.89	1.74	2.50
66.00	76.00	6.00	4.00	1.00	1.00	4.00	1.08	2.64	4.61	7.13	2.94	3.03	2.30	8.33	4.77	5.00	1.62	2.50
1.00	77.00	6.00	4.00	1.00	2.00	1.00	2.10	2.91	4.29	10.29	1.72	2.09	3.50	9.34	5.50	4.94	2.01	3.00
2.00	78.00	6.00	4.00	1.00	2.00	2.00	1.72	1.62	4.29	5.57	1.72	2.71	2.62	9.23	5.34	4.89	1.85	3.00
95.00	79.00	6.00	4.00	1.00	2.00	3.00	1.51	0.97	6.29	9.23	1.26	2.90	2.57	7.99	6.07	5.60	1.68	3.00
96.00	80.00	6.00	4.00	1.00	2.00	4.00	1.24	0.92	6.71	7.97	1.68	1.91	2.50	7.65	6.84	5.38	1.76	3.00
47.00	81.00	6.00	4.00	2.00	1.00	1.00	0.54	1.46	1.72	6.00	0.00	1.93	2.29	6.70	5.91	4.73	1.24	2.50
48.00	82.00	6.00	4.00	2.00	1.00	2.00	0.86	1.56	3.00	6.00	0.00	1.05	2.06	8.57	6.90	5.47	1.70	2.50
49.00	83.00	6.00	4.00	2.00	1.00	3.00	0.75	1.24	2.57	6.43	0.00	1.34	2.29	7.47	7.83	5.73	1.67	2.20
50.00	84.00	6.00	4.00	2.00	1.00	4.00	1.40	2.10	4.29	5.15	0.00	1.57	1.83	9.12	8.35	5.84	2.01	2.20
41.00	85.00	6.00	4.00	2.00	2.00	1.00	0.11	1.46	2.57	7.29	0.00	1.41	2.32	7.69	7.62	6.80	1.61	3.00
42.00	86.00	6.00	4.00	2.00	2.00	2.00	0.54	1.24	1.72	6.00	0.00	1.31	1.93	9.12	8.19	5.63	1.78	3.00
55.00	87.00	6.00	4.00	2.00	2.00	3.00	0.75	1.02	4.29	8.58	0.00	1.60	1.99	8.79	8.71	6.85	1.92	3.00
56.00	88.00	6.00	4.00	2.00	2.00	4.00	0.92	2.69	2.57	9.43	0.00	2.29	1.90	9.01	8.97	6.90	1.75	3.00
23.00	89.00	6.00	4.00	3.00	1.00	1.00	0.43	2.32	0.00	6.00	0.00	0.43	1.31	2.97	7.78	4.35	0.99	2.00
24.00	90.00	6.00	4.00	3.00	1.00	2.00	0.70	1.78	0.00	5.57	0.00	0.65	1.31	3.74	8.30	3.82	0.95	2.00
73.00	91.00	6.00	4.00	3.00	1.00	3.00	0.75	2.26	0.00	7.55	0.00	0.48	1.45	3.49	7.73	4.28	0.95	1.50
74.00	92.00	6.00	4.00	3.00	1.00	4.00	1.08	1.62	0.00	7.55	0.00	1.71	1.64	4.95	7.98	4.12	0.93	1.50
29.00	93.00	6.00	4.00	3.00	2.00	1.00	0.49	1.89	0.00	9.00	0.00	0.39	1.96	3.52	7.83	4.78	1.07	3.00
30.00	94.00	6.00	4.00	3.00	2.00	2.00	0.81	2.69	0.00	9.43	0.00	0.65	2.45	4.40	8.40	4.89	1.24	3.00
67.00	95.00	6.00	4.00	3.00	2.00	3.00	1.08	1.24	0.00	9.65	0.00	1.05	1.71	5.40	8.19	5.60	1.17	2.00
68.00	96.00	6.00	4.00	3.00	2.00	4.00	1.62	0.81	0.00	9.65	0.00	1.97	1.18	6.75	7.31	7.85	1.32	2.00

MOVING WEIGHTS AT THE SAME HEIGHT--
EFFECT OF HEIGHT, ANGLE OF MOVEMENT AND OBJECT VOLUME

by

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B.A., Kansas Wesleyan, 1974

AN ABSTRACT OF A MASTER'S THESIS

submitted in partial fulfillment of the
requirements for the degree

MASTER OF SCIENCE

Department of Industrial Engineering

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1976

Loads were transferred horizontally to gain insight into the effect of different conditions (height, angle of movement, and object volume) on the forces, torques and subject vote. Six female subjects transferred a 5 kg tote box for three heights (floor, knee, and hip) through four angles (45^{o}, 90^{o}, 135^{o} and 180^{o}) and two different volumes ($(15\ cm)^3$ and $(30\ cm)^3$) four times.

As height increased,lateral, vertical and frontal forces decreased. As angle increased,vertical and lateral force increased where as frontal force decreased. As volume increased,lateral, vertical and frontal forces increased.

As height increased,somersault and twist torques decreased, but cartwheel torque was not affected. As angle increased,somersault torque decreased, but cartwheel and twist torques increased. As volume increased, somersault, cartwheel and twist torques increased.

Vote decreased as height increased, but increased as angle and volume increased.

The most important design decision is to avoid horizontal transfers below the knees; there is only a small difference between knee and hip height transfers. A smaller angle of rotation and more compact loads also are preferred.