

ERGO **ergo ADL**

**Ergonomics of Everyday Living**

"Aarrggg"      The Difference Is Simple Ergonomics!      - SAM -

gillick@ucsd.edu      www.DrGillick.com

1

ERGO **ergo ADL**

# Ergonomics

IN THE

## ACTIVITIES OF DAILY LIVING

John Gillick, MD

UCSD Clinical Professor  
Internal Medicine and Anesthesiology,  
non-salaried

gillick@ucsd.edu      www.DrGillick.com

2

ERGO **ergo ADL**

## Human Engineering

**Ergonomics**

Human Engineering to prevent INJURY  
from WORK MECHANICS both  
Occupational and Non-occupational

gillick@ucsd.edu      www.DrGillick.com

3

ERGO **ergo ADL**

# BIO-MECHANICS

gillick@ucsd.edu      www.DrGillick.com

4

ERGO **ergo ADL**

# ERGONOMICS

*the science of Human Engineering*

Derived from the Greek:

**ERGON** --work  
&  
**NORMOS** -- natural laws

of...

There are two principles of Ergonomics:

- Fitting the person to the job;
- Fitting the job to the person

gillick@ucsd.edu      www.DrGillick.com

5

ERGO **ergo ADL**

# ERGONOMICS

*study workplace design*

## INTENT:

Remove/ reduce the need for humans  
to adapt to  
unsuitable conditions or environments

gillick@ucsd.edu      www.DrGillick.com

6

MSDs

ergo  
ADL

# GOAL

## DECREASE INJURY

especially

MUSCULO - SKELETAL  
DYSFUNCTIONS  
(MSDs)

7  
jgillick@ucsd.edu www.DrGillick.com

MSDs

ergo  
ADL

# MSDs

MUSCULO-SKELETAL DISORDERS

=

CTDs  
( CUMULATIVE TRAUMA DISORDERS )

+

RSIs / RSDs  
( REPETITIVE STRAIN INJURIES/ DISORDERS )

8  
jgillick@ucsd.edu www.DrGillick.com

MSDs

ergo  
ADL

# MSDs

Parts of the Body Affected by MSDs

Back	Wrists
Neck	Hands
Shoulders	Fingers
Arms	Legs

9  
jgillick@ucsd.edu www.DrGillick.com

MSDs

ergo  
ADL

# MSD SIGNS

- Decreased range of motion
- Deformity
- Decreased grip strength
- Loss of muscle function

10  
jgillick@ucsd.edu www.DrGillick.com

MSDs

ergo  
ADL

# MSD SYMPTOMS

- Pain (not discomfort)
- Numbness
- Tingling
- Burning
- Cramping, and
- Stiffness

11  
jgillick@ucsd.edu www.DrGillick.com

MSDs

# SOURCE

*PAIN Symptoms  
are 95%  
Musculo-skeletal – Myofascial  
in origin*

12  
jgillick@ucsd.edu www.DrGillick.com

Pathophysiology of MSDs ergo  
ADL

# MSD Pain

IS

## CHRONIC MUSCULAR SPASM

1<sup>o</sup> (muscle - motor unit - fatigue)  
2<sup>nd</sup>ary (nerve entrapment)

### MUSCLE FATIGUE MUSCLE CONTRACTIONS

jgillick@ucsd.edu www.DrGillick.com 13

Pathophysiology of MSDs ergo  
ADL

## Two types of Muscle Contractions

- 1 **DYNAMIC**  
(May be repetitive)  
loading // unloading with REST cycle
- 2 **STATIC**  
high or low forced contractions – no movement  
sustained \* absent\* REST cycle

jgillick@ucsd.edu www.DrGillick.com 14

Pathophysiology of MSDs ergo  
ADL

# STATIC CONTRACTION

## MUSCLE INJURY

occurs when

Normal signals of fatigue  
are  
suppressed or ignored  
with  
LOSS of REST cycle

jgillick@ucsd.edu www.DrGillick.com 15

Pathophysiology of MSDs ergo  
ADL

# FATIGUED MOTOR UNIT

muscle, tendon and nerve

REQUIRES

## FULL RECOVERY

jgillick@ucsd.edu www.DrGillick.com 16

Pathophysiology of MSDs ergo  
ADL

# FATIGUED MUSCLE

HELD

in a  
SHORTENED or an EXTENDED  
posture

-is  
**-Further Damaged –  
-PREVENTING RECOVERY**

jgillick@ucsd.edu www.DrGillick.com 17

Pathophysiology of MSDs ergo  
ADL

## REPEATED LOSS of REST cycle

damages  
circulatory and metabolic mechanisms  
with

## DEATH OF MUSCLE CELLS

jgillick@ucsd.edu www.DrGillick.com 18

Pathophysiology of MSDs ergo  
ADL

**REPEATED  
MUSCLE**

# OVERLOAD and FATIGUE

causes  
replacement of damaged muscle tissue  
with

## FIBROTIC or SCAR tissue

iglick@ucsd.edu 19  
www.DrGlick.com

MSDs ergo  
ADL

## MSD Risk Factors

- Force
- Repetition
- Awkward postures \*\* ←
- Static postures \*\* ←
- Quick motions
- Compression or contact stress
- Vibration
- Cold temperatures

iglick@ucsd.edu 20  
www.DrGlick.com

ERGO ergo  
ADL

## ERGONOMICS

*the science of Human Engineering*

**Work necessarily includes:**

**All activities related to occupation**

as well as

**All activities of daily living**

– 24 hours a day – 7 days a week...

*breathing, sleeping, walking, sitting, driving, recreation ...*

iglick@ucsd.edu 21  
www.DrGlick.com

ERGO ergo  
ADL

## Ergonomics -- Work Place

Computer	Lift angles	Temperature
Keyboard	Platforms	Vibration
Office	Shoes	Air Quality
Desk	Robots	Dust
Chair	Standing surface	Noise
Monitor	Psychological – environment	Traffic
Mouse		Sunlight
Tools		Moisture
		Break time

**ADL** **Breathing  
Sleeping  
Standing  
Sitting  
Driving**

Activities of Daily Living

iglick@ucsd.edu 22  
www.DrGlick.com

There are 168 hours in a week (7 x 24) ergo  
ADL

## In each 168 hour week:

- 168 hours are spent breathing
- 48 ± 10 hours are spent sleeping: in bed or down
- 120 ± 10 hours are spent up, out of bed
- 45 ± 15 hours are spent standing/ walking
- 45 ± 15 hours are spent sitting
- 10 ± 5 hours are spent driving/ riding In transport
- 5 ± 5 hours are spent grooming
- 5 ± 5 hours are spent exercising, fitness/ sports

**BASIC ACTIVITIES OF DAILY LIVING**

iglick@ucsd.edu 23  
www.DrGlick.com

1

# WE BREATHE THROUGH OUR NOSE

**168 /168**

iglick@ucsd.edu 24  
www.DrGlick.com

**Breathing – accessory muscles**

ergo  
ADL

25  
www.DrGlick.com

ergo  
ADL

26  
www.DrGlick.com

**MAJOR LOSS  
PRODUCTIVE WORK TIME**  
in industry caused by  
**ALLERGY AND HEAD COLDS.**

in effectively off set by  
sedating antihistamines and OTC preparations.

effectively off set by  
non-sedating antihistamines

**SLEEP**

J Occup Environ Med. 2003; 45:941-955  
September, 2003 – on >10,700 workers

ergo  
ADL

27  
www.DrGlick.com

**Breathing problems are Magnified  
at night by  
Allergy and Sleep Position**

Can't sleep  
when  
can't breathe

~~Afrin~~

allegra-D

ergo  
ADL

28  
www.DrGlick.com

**2**

**SLEEP**

IS THE  
MOST POWERFUL  
WEAPON

48 / 168

ergo  
ADL

29  
www.DrGlick.com

**Sleep Position**

ergo  
ADL

30  
www.DrGlick.com

## ? SLEEP POSITION RELATED ? MSDs

ergo  
ADL

- Neck, shoulder, arm, wrist, hand – CTS
- Low back – hyper-extension, torque
- Headaches, TMJ
- Shoulder impingement & SLAP
- Cervical arthritis – radiculopathies
- TOS – SAS, CCS and Hyper-abd Sd.
- Thoracic strain – Facets –cervical, thoracic & lumbar
- Ilio-psoas – *mergalia paresthetica*, femoral nerve palsy

igillick@ucsd.edu 31 www.DrGillick.com

## Sleep Position

ergo  
ADL

Multiple myofascial strains

igillick@ucsd.edu 32 www.DrGillick.com

## MOST POPULAR SLEEPING POSITIONS

ergo  
ADL

Foetus  
41%

Log  
15%

Yearner  
13%

Soldier  
8%

Freefaller  
7%

Starfish  
5%

### What position do you sleep in most frequently?

CHOICE	BRIT:1000 (Ildzikowski)	US: % of 4622	Votes
Foetus	41%	2253	49%
Log	15%	59	1%
Yearner	13%	552	12%
Soldier (Back-arms @ side)	8%	194	4%
Starfish (Back - arms up)	5%	306	7%
Free-faller (stomach)	7%	957	21%
None of the above	10%	301	7%

igillick@ucsd.edu 33 www.DrGillick.com

## Sleep Position

ergo  
ADL

- SIDE – 55%** - Aligned: axial and extremities – 1 / 3  
Torqued: neck, axial, extremities – 2 / 3
- BACK – 15%** - Elbows flat on mattress or overhead – 4 / 5  
Elbows above mattress & below chest – 1 / 5
- PRONE – 20%** - Both elbows overhead, head twisted – 1 / 2  
One elbow overhead, knee pulled up – 1 / 2
- Stomach**
- OTHER, ALL OVER – 10%** - Move because body parts are painful +/- going numb – or cant breathe

igillick@ucsd.edu 34 www.DrGillick.com

## Sleep Position

ergo  
ADL

### SIDE -55%

☺ 1/3 Aligned: axial and extremities – 17%  
☹ 2/3 Twisted: neck, axial, extremities – 38%

**Pillow under shoulder**

- Scaleneus anticus sd
- Twisted TS & LS = facet prob
- Headaches, Trap & LS strains
- Wry neck

**Elbow overhead**

- Levator scap & Trap strain
- Shoulder impinge/ SLAP
- Scaleneus anticus sd.

Foetus 41%

igillick@ucsd.edu 35 www.DrGillick.com

## Sleep Position

ergo  
ADL

### PRONE – 20%

☹ 2/5 Both elbows above chest, head twisted – 9%  
☹ 2/5 One elbow above chest, knee pulled up – 8%  
☹ 1/5 Both elbows at the side – 2%

**Neck twisted to side**

- Cervical strain/ arthritis, disc
- TMJ, possible pterygium
- Breathing dysfunction
- Headaches, migranes

**Elbows overhead**

- Levator scapulae strain
- Shoulder impinge/ SLAP
- Scaleneus anticus sd.
- Trapezius strain

Freefaller 7%

**Prone Torso**

- Low & thoracic strains/ twist
- Knee up → Ilio-psoas strain
- Facet strains, arthritis

igillick@ucsd.edu 36 www.DrGillick.com

## Sleep Position

ergo  
**ADL**

**BACK -15%**

- 4/5 Elbow (s) flat on mattress or overhead and /or legs flat with back arched – 12%
- 1/5 Elbows up above mattress & below chest – 3%






**Elbows overhead**

- shoulder impinge/ SLAP
- scaleneus anticus sd.
- trap, LS & Infraspinatus strain

**Elbows flat / mattress**

- Costo-clavicular sd

**Knees flat –arched back**

- Low back strain, arthritis, facet

37  
www.DrGlick.com




## Sleep Position

ergo  
**ADL**

**OTHER, ALL OVER -10%**

Move because body parts are painful +/- going numb – or can't breathe Usually mixes – stomach, back, twisted side

All the Previous problems

38  
www.DrGlick.com

## Sleep Position

ergo  
**ADL**

**SIDE – 55%**

- 1/3 Aligned: axial and extremities – 17%
- 2/3 Torqued: neck, axial, extremities – 38%

**BACK – 15%**

- 1/5 Elbows flat on mattress or overhead – 12%
- 4/5 Elbows above mattress & below chest – 3%

**PRONE – 20%**

- 1/2 Both elbows overhead, head twisted – 10%
- 1/2 One elbow overhead, knee pulled up – 10%

**STOMACH**

**OTHER, ALL OVER – 10%**

Move because body parts are painful +/- going numb – or can't breathe Usually includes stomach and back

39  
www.DrGlick.com

## ? SLEEP POSITION RELATED ? MSDs

ergo  
**ADL**

- Neck, shoulder, arm, wrist, hand – CTS
- Low back – hyper-extension, torque
- Headaches, TMJ
- Shoulder impingement & SLAP
- Cervical arthritis – radiculopathies
- TOS – SAS, CCS and Hyper-abd Sd.
- Thoracic strain – Facets –cervical, thoracic & lumbar
- Ilio-psoas – *mergalia paresthetica*, femoral nerve palsy

40  
www.DrGlick.com

## Sleep Positions – SAFE STANDARD

ergo  
**ADL**





41  
www.DrGlick.com

## Sleep Positions BODY PILLOWS

ergo  
**ADL**





42  
www.DrGlick.com

**Sleep Positions**  
**BODY PILLOWS & Gimmicks**



ergo ADL



UNIQUE PILLOW TURNS STRESS TO REST!



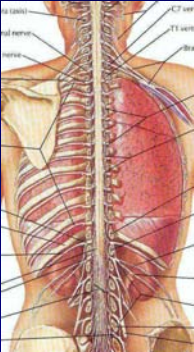

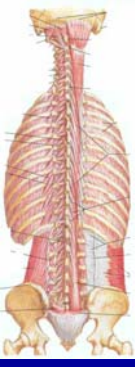

43  
www.DrGlick.com

**3** WE ARE  
**OUT OF BED**  
**BALANCE**  
**BALANCING /SUPPORTING**  
**HEADS AND TORSOS**  
STANDING - **BALANCE**  
includes  
SITTING - **POSTURE**  
SLOUCHING - **120 ±10 /168**

ergo ADL

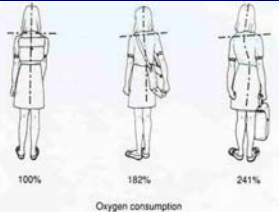
44  
www.DrGlick.com

**BALANCE**  
**How straight is the spine ?**  
How does it stay straight?

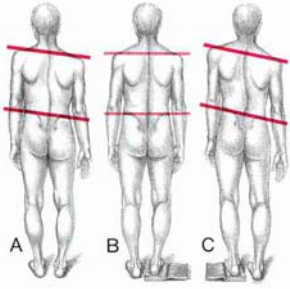
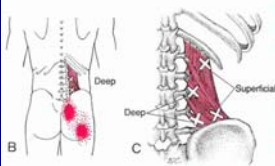




45  
www.DrGlick.com

**BALANCE**  
**Functional scoliosis** **Leg-length differences**

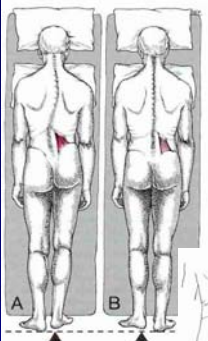
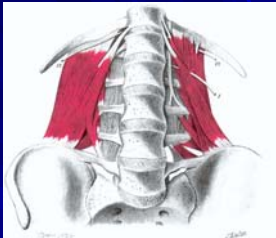



Oxygen consumption

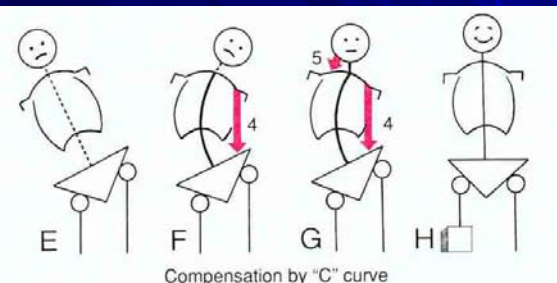
46  
www.DrGlick.com

**Functional scoliosis** **BALANCE** **Leg-length differences**

47  
www.DrGlick.com

**Leg-length differences** **BALANCE**



Compensation by "C" curve

48  
www.DrGlick.com

**Leg-length differences** ergo ADL

**BALANCE** 49  
www.DrGlick.com

**Leg-length differences** The eyes and the nose will be balanced - **midline – above the pelvis** ergo ADL

**BALANCE**

Note: With a "C" curve the "short-side" shoulder is elevated

Note: With a "S" curve the "long-side" shoulder is elevated

Note: With the torso balanced, the shoulders are level

"C" curve "S" curve Compensated

50  
www.DrGlick.com

**4** WE **STAND /BALANCE ON OUR FEET** ergo ADL

**BALANCE** 45 ±15 /168

51  
www.DrGlick.com

**Feet - arches** ergo ADL

**BALANCE**

52  
www.DrGlick.com

**Feet - arches** ergo ADL

Arches Normal Arches Low

**BALANCE**

53  
www.DrGlick.com

**Feet - arches** ergo ADL

**BALANCE**

54  
www.DrGlick.com

**Feet - arches**

ergo  
**ADL**

55  
www.DrGlick.com

**BALANCE**

**Feet - arches**

ergo  
**ADL**

56  
www.DrGlick.com

**5**

**WE**

**SIT / BALANCE**

**ON OUR**

**BUTTOCH**

**BALANCE** **45 ±15 /168**

ergo  
**ADL**

57  
www.DrGlick.com

**PROBLEMS** during sitting

ergo  
**ADL**

➤ **Back pocket lump (wallet):** ➔  
*Wallet in the back pocket*

**Short hemi-pelvis:** ➔  
*Short hemi-pelvis*

**Torso-support, short-arms, long-waist:** ➔  
*Short-arms*

**BALANCE**

58  
www.DrGlick.com

**Wallet in the back pocket**

**INJURIES DURING SITTING**

ergo  
**ADL**

**Wallet Back Pocket** **Clear Back Pocket**

59  
www.DrGlick.com

**Wallet in the back pocket**

ergo  
**ADL**

**"Radicular pain" from butt to the back of knee**

60  
www.DrGlick.com

Wallet in the back pocket



P-1



M-1



ergo  
ADL

jgillick@ucsd.edu

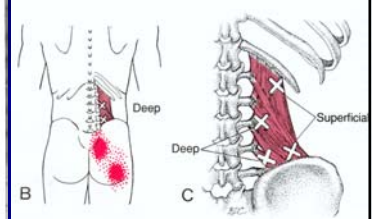
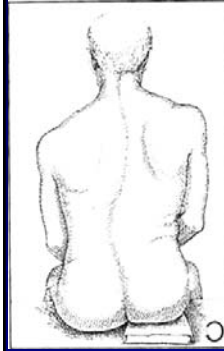
BALANCE

www.DrGillick.com

61

Wallet in the back pocket  $\equiv$  similar also to short hemi-pelvis problems

ergo  
ADL



jgillick@ucsd.edu

BALANCE

www.DrGillick.com

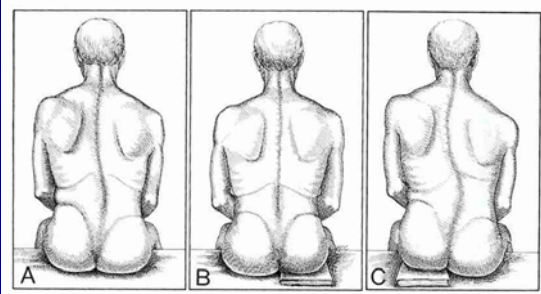
62

Short hemi-pelvis

## Short hemi-pelvis

Need to sit twisted -hurts low back and upper back

ergo  
ADL



jgillick@ucsd.edu

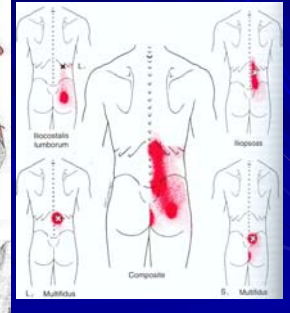
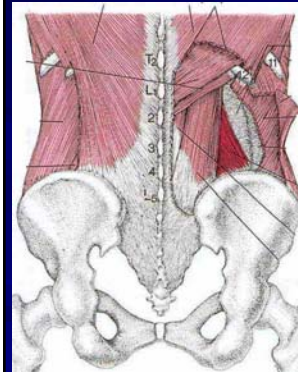
BALANCE

www.DrGillick.com

63

Short hemi-pelvis

ergo  
ADL



jgillick@ucsd.edu

BALANCE

www.DrGillick.com

64

Short hemi-pelvis

ergo  
ADL



jgillick@ucsd.edu

BALANCE

www.DrGillick.com

65

Short hemi-pelvis

ergo  
ADL



jgillick@ucsd.edu

BALANCE

www.DrGillick.com

66

**Short-arms** ergo ADL

## Short-arms -- Long-waist

A B C

**BALANCE**

67  
www.DrGlick.com

**Short-arms** ergo ADL

## Short-arms -- Long-waist

Strain on neck, arms, upper back and lower back...  
Upper body never supported -- elbows don't reach support

D E

**BALANCE**

68  
www.DrGlick.com

**Short-arms + Short hemi-pelvis** ergo ADL

## Short-arms -- Long-waist

Strain on neck, arms, upper back and lower back...  
Upper body never supported -- elbows don't get support

D E

**BALANCE**

69  
www.DrGlick.com

**Short-arms** ergo ADL

## BALANCE

**BALANCE**

70  
www.DrGlick.com

**Short-arms** ergo ADL

**BALANCE**

71  
www.DrGlick.com

**Short-arms + Short hemi-pelvis** ergo ADL

**BALANCE**

72  
www.DrGlick.com

# WE DRIVE / TRAVEL

AS WE SIT, BALANCE and  
OPERATE THE MACHINE

10 ±10 /168

## Stick-shift vehicle



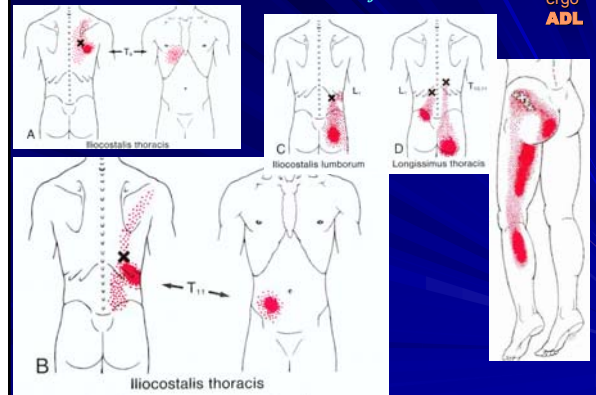
## AUTOMOBILE

### SELECTION AND USAGE

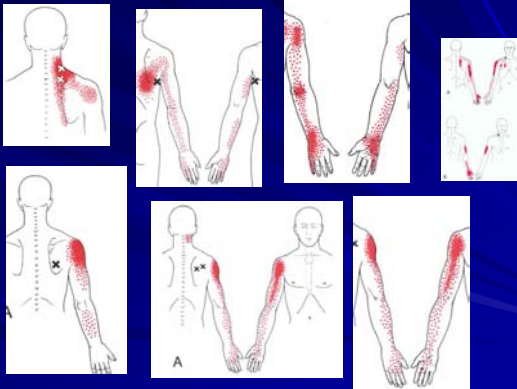
- **Stick-shifter:** -- wrist, shoulder, neck, – also, back, hip, knee
- **Arm-elbow support:** – upper & lower back
- **Pedals:** torque & strain of back, hips, knee
- **Seat:** -- fit, balance, torque by size or anatomy
- **Steering wheel:** -- neck, scalenes
- **Arm-rest:** -- ulnar nerve

Select VEHICLE by COCKPIT

## Stick-shift vehicle



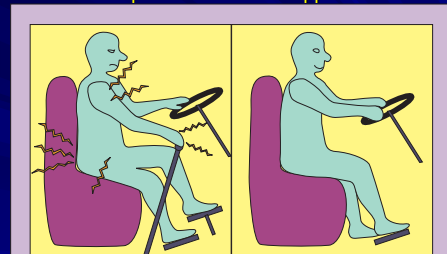
## Stick-shift vehicle



## Stick-shift vehicle

### Vehicle – stick vs. Automatic, etc.

Torque – Position -- Support



Drive stick and clutch

Automatic

ergo ADL

There are 168 hours in a week (7 x 24)

**In each 168 hour week:**

- 168 hours are spent breathing
- 48 ± 10 hours are spent sleeping: in bed or down
- 120 ± 10 hours are spent up, out of bed
- 45 ± 15 hours are spent standing/ walking
- 45 ± 15 hours are spent sitting
- 10 ± 5 hours are spent driving/ riding in transport
- 5 ± 5 hours are spent grooming
- 5 ± 5 hours are spent exercising, fitness/ sports

**BASIC ACTIVITIES OF DAILY LIVING**

79  
iglick@ucsd.edu www.DrGlick.com

1 ergo ADL

**WE BREATHE THROUGH OUR NOSE**

168 /168

80  
iglick@ucsd.edu www.DrGlick.com

2 ergo ADL

**SLEEP IS THE MOST POWERFUL WEAPON**

48 /168

81  
iglick@ucsd.edu www.DrGlick.com

3 ergo ADL

**WE ARE OUT OF BED**

BALANCING /SUPPORTING

**OUR HEADS AND TORSOS**

**STANDING – SITTING - SLOUCHING**

120 ±10 /168

82  
iglick@ucsd.edu www.DrGlick.com

4 ergo ADL

**WE STAND /BALANCE ON OUR FEET**

45 ±15 /168

83  
iglick@ucsd.edu www.DrGlick.com

5 ergo ADL

**WE SIT / BALANCE ON OUR BUTTOCH**



45 ±15 /168

84  
iglick@ucsd.edu www.DrGlick.com

6

ergo  
ADL

**WE**  
**DRIVE / TRAVEL**  
**AS WE SIT ON THE**  
**BUTTOCH**

10 ±10 /168

igillick@ucsd.edu 85 www.DrGillick.com

ergo  
ADL

**EDUCATION**  
**REQUIRES**  
**AN INFORMED**  
**EDUCATOR**

igillick@ucsd.edu 86 www.DrGillick.com

ergo  
ADL

**FIND AND ADDRESS**  
**THE**  
**CAUSE**  
**VS**  
**(remaining ignorant)**  
**IDIOPATHIC**

igillick@ucsd.edu 87 www.DrGillick.com

ergo  
ADL

**ACCURATE ANSWERS**  
**ARE SIMPLE**  
**&**  
**MAKE SENSE**  
**DESPITE DOGMA**

igillick@ucsd.edu 88 www.DrGillick.com

**SHORT LIST** (posture & symmetry)

- **Breathing – nose, neck angle (posture)**
- **Sleeping position (posture)**
- **Feet – ankle support – arches (posture)**
- **Standing symmetry – anatomy, load (posture)**
- **Back pocket wallet (posture)**
- **Sitting symmetry, balance (posture)**
- **Forearm support – anatomy – load activity (posture)**

igillick@ucsd.edu 89 www.DrGillick.com

ergo  
ADL

ERGO MSDs

The Difference Is Simple Ergonomics!

UCSD Healthcare  
John S. Gillick, MD, MPH, FACP  
Clinical Professor of Medicine & Biomechanics, non-salaried  
Att. Med. Coll. PreventiveMedicine, Endocrinol. & Anesthesiology

Center for Occupational & Environmental Medicine  
310 LEWIS STREET, SUITE 100  
SAN DIEGO, CALIFORNIA 92161-2119

igillick@ucsd.edu 90 www.DrGillick.com