

# THE 'STANDARD' PIANO KEYBOARD – TOO BIG FOR TOO MANY

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## The Nineteenth Century

- Piano keyboards varied in size up until the late 1800s.
- Significant repertoire written between 1750 and 1850 when the keyboard was smaller.
- Women not encouraged to be public performers – for them, piano playing was a social activity within the home. They were expected to be dignified, feminine and graceful, and were discouraged from attempting certain repertoire.
- Separate competitions with different repertoire for women.

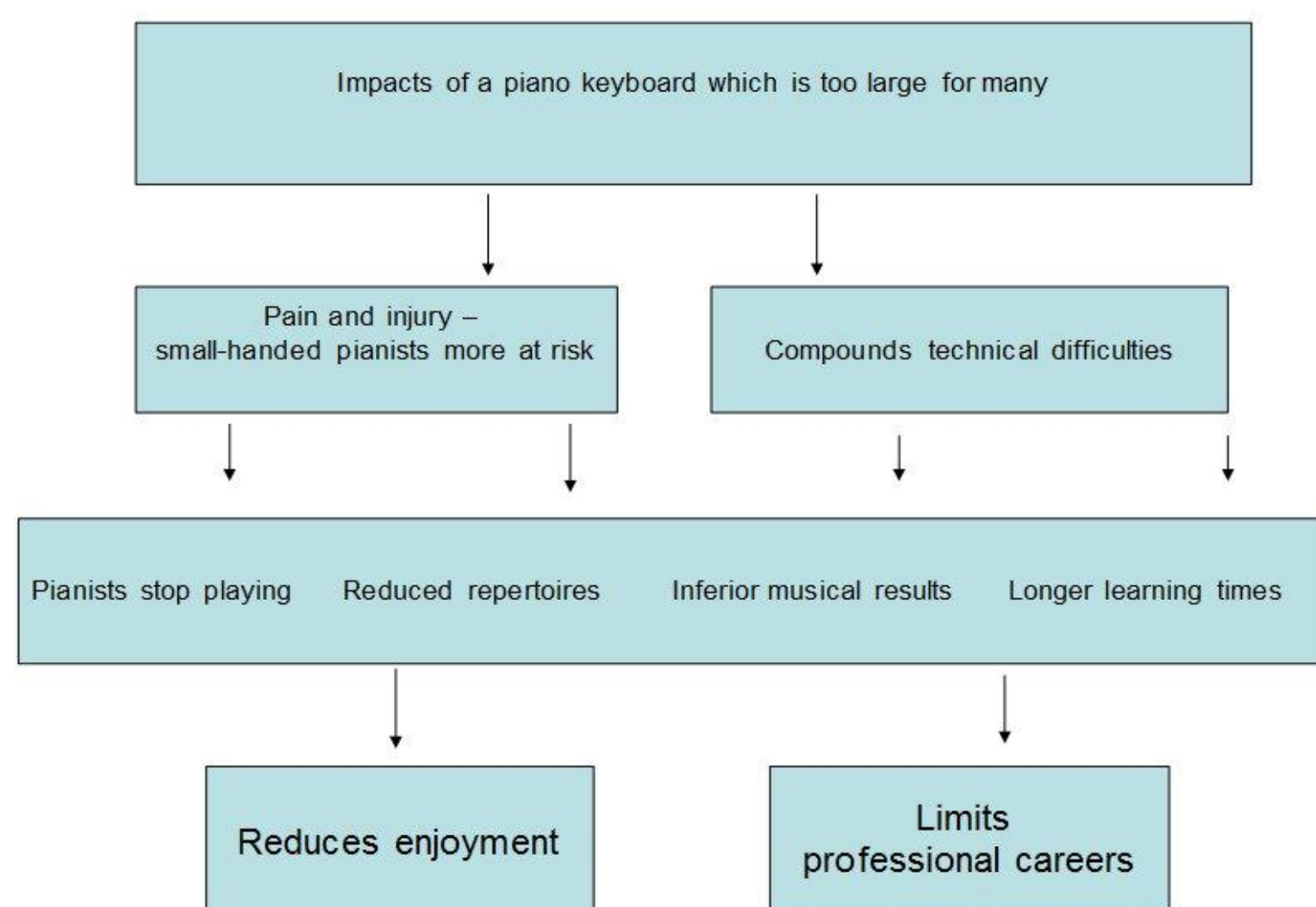
## In the 1880s...

- Famous European male composers/virtuosos had a strong influence in piano manufacturing.
- Manufacturers built large concert venues and wanted bigger instruments.
- Their 'house' pianists – e.g. Liszt, Kalkbrenner – performed to help market these pianos.
- Surgeons operated on some pianists to sever the tendons between 4<sup>th</sup> and 5<sup>th</sup> fingers.

## Twentieth century...

- Repertoire has become 'stretchier'
- Women often outnumber men in conservatories
- Increasing participation of Asian populations

## TODAY...



## What is the evidence for the 'one size fits all' keyboard being too big for too many?

### 1. Performing arts medicine

Wide range of evidence linking hand span to pain and injury from:

- Epidemiology
- Clinical studies
- Principles of biomechanics and ergonomics
- Comparative studies using keyboards of different widths.

Strong evidence that passages of fast octaves and large chords are associated with pain and injury. These repeatedly force small hands out of the desirable 'anatomically neutral' position.

Women are about 50% more likely to be affected than men.

Intensity of practice is also a risk factor – likely to be a compounding effect for small-handed pianists as they will often have to practice more than those with larger hands (everything else being equal).

Children as well as adults are affected.

### 2. Biomechanics and ergonomics

Factors influencing technical and musical outcomes:

- Direct mechanical disadvantages from hand span not being well matched to keyboard size:-
  - Finger abduction and curvature
  - Wrist and arm position
  - Lateral hand movement
  - Forward and backward hand movement
  - Percussiveness
- Muscular tension and fatigue resulting from (1)
- Added load on central nervous system from (1) and (2).

Impacts of small hand spans:

- Reduced power and speed
- Reduced dynamic control and range, including voicing of chords & melody lines
- Reduced rhythmic control
- Less accuracy – or more practice needed to achieve accuracy
- Inferior legato and phrasing, (e.g. legato octaves not possible)
- Brain pre-occupied with 'getting the notes' rather than musical outcomes.

The ideal position for the hand is 'anatomically neutral' for as much playing time as possible.

*'Three factors that determine amount of stretch – finger length, hand width and angle of abduction – explain a surprisingly large number of technical difficulties that are often wrongly attributed to defects of coordination and studentship' ....Otto Ortmann, 1929.*

### 3. Piano competition results

- Dominance of males over females among prize winners in major international competitions, apart from Bach and Mozart...
- Very few women from Asian backgrounds at the top level.
- MTNA results in America (and EPTA UK) show drop-off of girls in higher age groups.
- This drop-off is not observed in the MTNA string competition.

Table 2: US MTNA competitions – number of first prize winners (1963/64 - 2015/16)

	PIANO		STRINGS	
	Males	Females	Males	Females
Junior (11-14)	23	30	14	18
Senior (15-18)	28	23	21	30
Young Artist (19-26)	32	16	19	26

Table 1: International Piano Competition Winners

Competition	Total number of prize winners*			Number of first prize winners		
	Males	Females	Females as % of total	Males	Females	Females as % of total
Van Cliburn	68	15	22%	12	2	14%
Leeds	74	25	25%	16	2	11%
Sydney	83	20	19%	9	2	18%
London	30	1	3%	6	1	14%
Cleveland	75	23	23%	15	5	25%
Tchaikovsky	43	8	16%	11	1	8%
Gina Bachauer	65	14	18%	14	2	12%
Liszt	31	10	34%	9	1	10%
Chopin (since 1955)	54	34	39%	9	2	18%
Beethoven (Women)	29	10	25%	9	4	30%
Mozart (17 years & above)	21	41	66%	6	14	70%
Bach	16	21	57%	2	2	50%

\*excluding special prizes

## 4. Hand span analysis

## Results from a recent survey of 473 pianists

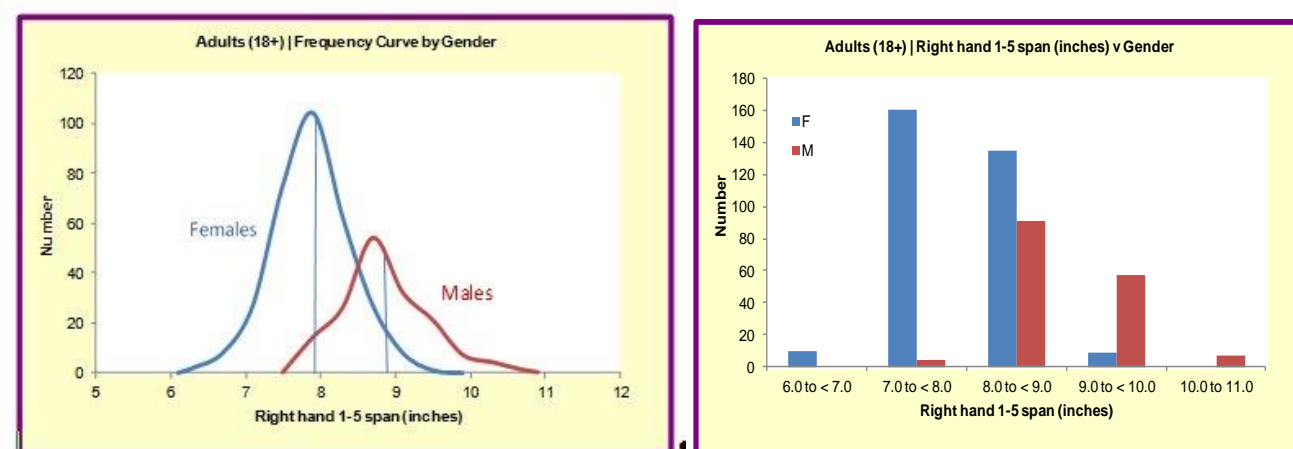
### Gender Difference

- The difference between male and female hand spans is significant.
- Results for thumb to fifth finger (1-5) and second to fifth finger (2-5) spans follow the normal distribution.

#### Results for thumb to fifth finger maximum spans

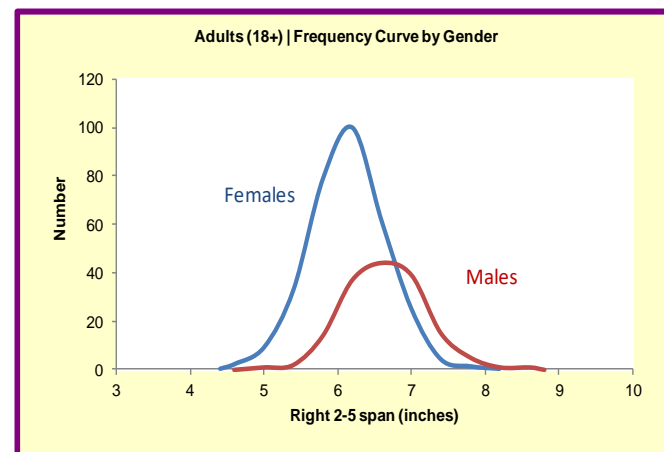
- On average, males can reach one extra white key – their average span is one inch more than for females.
- The difference between the smallest female and largest male is more than the width of four white piano keys.
- Comparing the results with a separate small study of children's hand spans, we find that a significant proportion of adult females (<7.5 inch span) have 'child-sized' spans.

Adult pianists – Right hand 1-5 span by gender – Key statistical measures				
Sample size	Males		Females	
	Inches	Centimetres	Inches	Centimetres
Minimum	7.8	19.7	6.4	16.3
Maximum	10.8	27.4	9.5	24.1
Arithmetic mean	8.9	22.6	7.9	20.1
Standard Deviation	0.56	1.43	0.53	1.35



#### Results for second to fifth finger maximum spans

- The male average is 6.7 inches (17 cm) compared with the female average of 6.2 inches (15.7 cm).



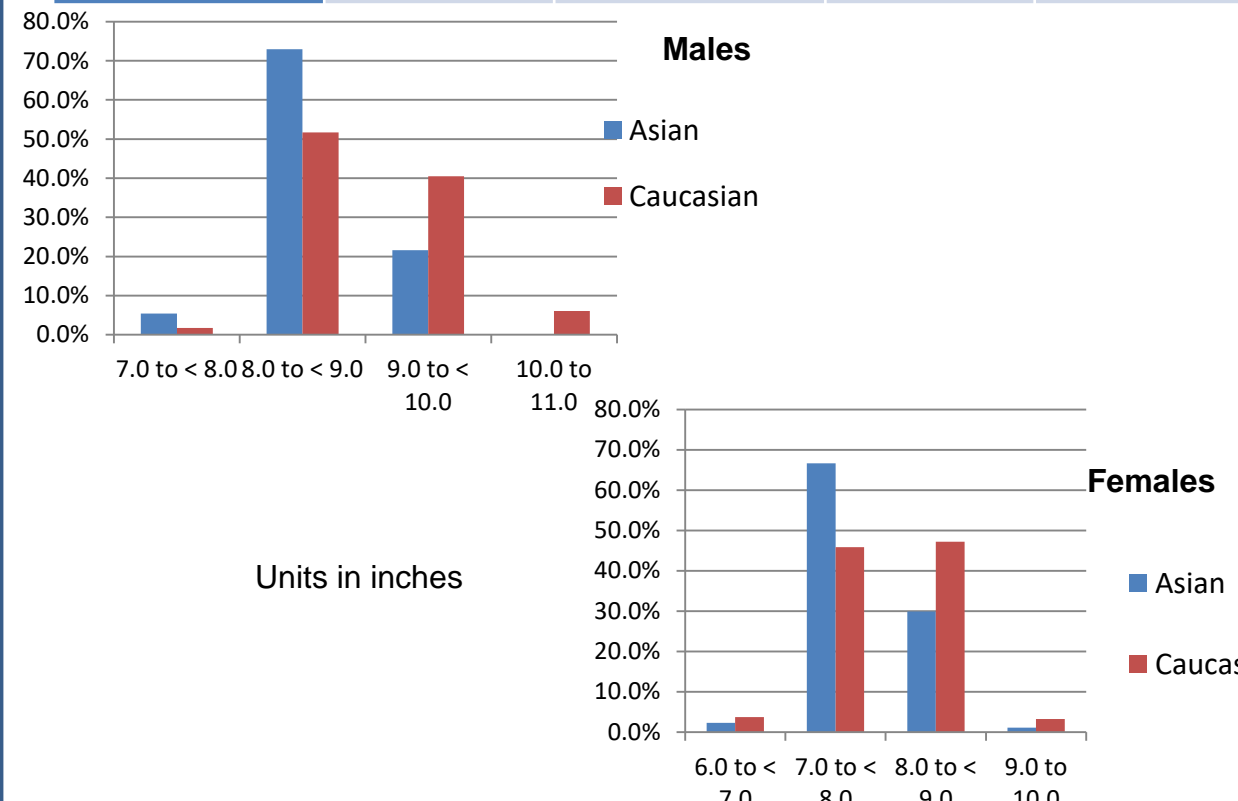
### Ethnic Differences

- Hand spans (thumb to fifth finger) of Caucasians are significantly larger than those of Asians (mostly Chinese in the sample).
- But this difference is much smaller than the gender difference within each ethnic group.
- For each gender, there is no significant difference in second to fifth finger spans between the ethnic groups. (This means that Asians have a relatively better 2-5 stretch than Caucasians in relation to total hand size).

#### Results for thumb to fifth finger maximum spans

Adult pianists – Male right hand 1-5 span by ethnicity – Key statistical measures				
Sample size	Caucasian Males		Asian Males	
	Inches	Centimetres	Inches	Centimetres
Minimum	7.8	19.8	7.8	19.7
Maximum	10.8	27.4	9.4	24.0
Arithmetic mean	9.0	22.8	8.7	22.0
Standard	0.60	1.52	0.38	0.97

Adult pianists – Female right hand 1-5 span by ethnicity – Key statistical measures				
Sample size	Caucasian Females		Asian Females	
	Inches	Centimetres	Inches	Centimetres
Minimum	6.4	16.3	6.8	17.2
Maximum	9.5	24.1	9.0	22.9
Arithmetic mean	8.0	20.2	7.8	19.8
Standard Deviation	0.54	1.38	0.45	1.15



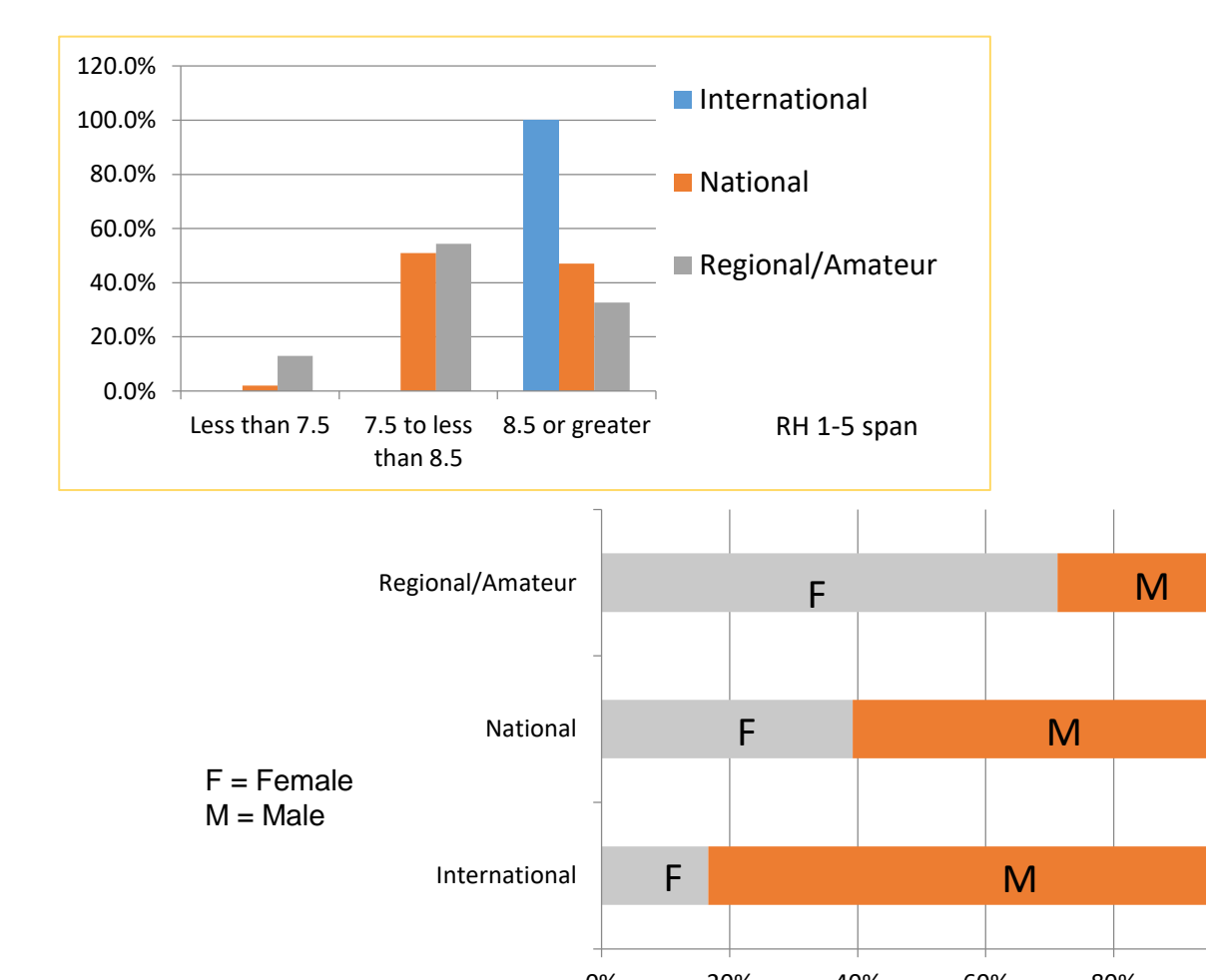
### Level of Acclaim

Three categories:

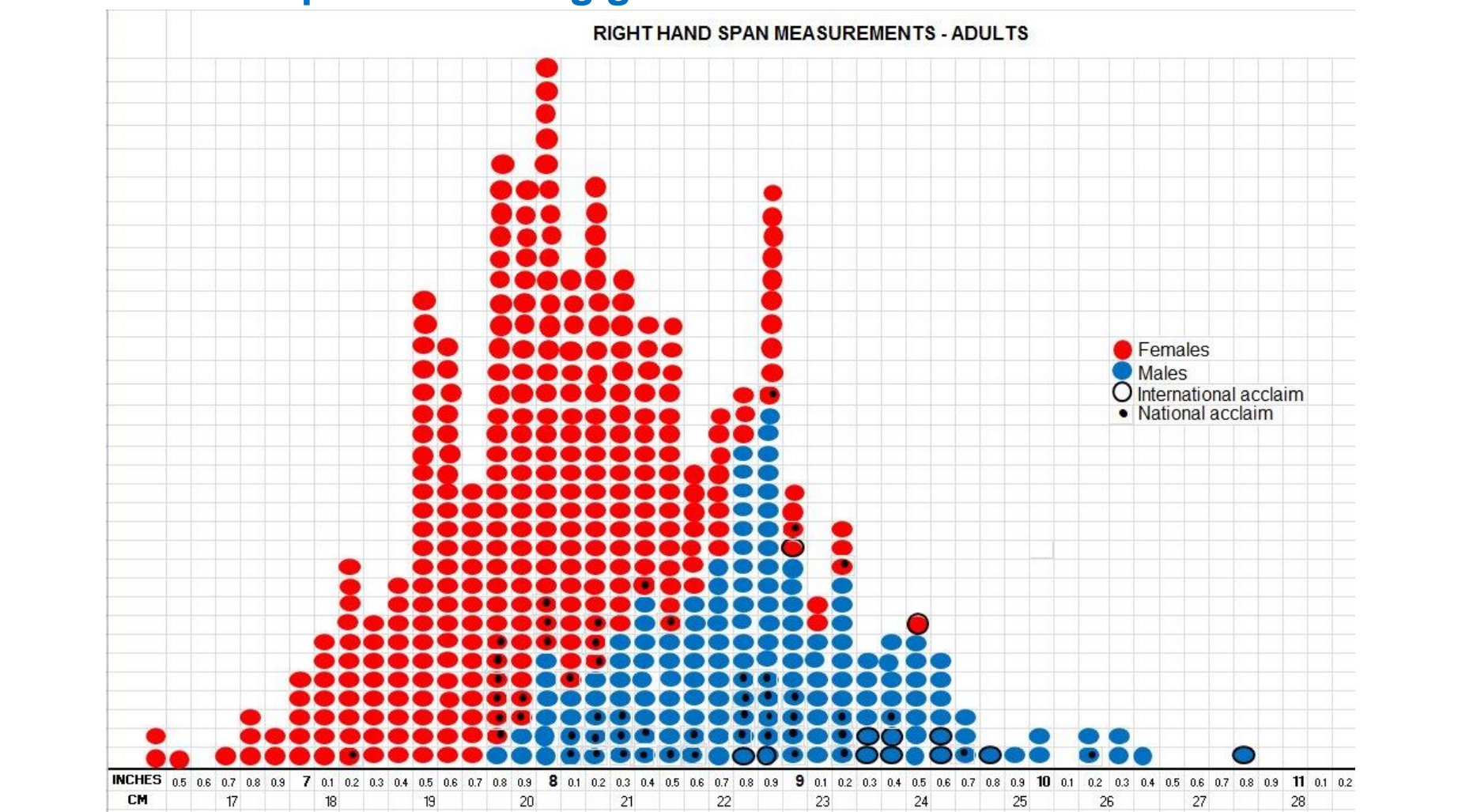
- International:** international solo career in major venues, internationally acclaimed recordings OR major competition prize-winner, wide range of repertoire.
- National:** long-standing career in home country as soloist, chamber musician or accompanist, nationally-acclaimed recordings OR prize-winner in national competition.
- Regional/Amateur:** All others, including teachers, occasional performers at community events, keen amateurs or those who learnt for several years.

Results provide evidence that hand span is a factor in achieving international and to a lesser extent, national acclaim. All Internationals had 1-5 spans above 8.5 inches.

Adult pianists – Right hand 1-5 span by level of acclaim – Key statistical measures								
Sample size	All adults		International		National		Regional/Amateur	
	473		12		51		410	
	Inches	Cm	Inches	Cm	Inches	Cm	Inches	Cm
Minimum	6.4	16.3	8.8	22.4	7.2	18.3	6.4	16.3
Maximum	10.8	27.4	10.8	27.4	10.2	26.0	10.5	26.7
Arithmetic mean	8.2	21.0	9.5	24.0	8.5	21.6	8.2	20.8
Standard Deviation	0.71	1.81	0.52	1.32	0.57	1.45	0.70	1.77



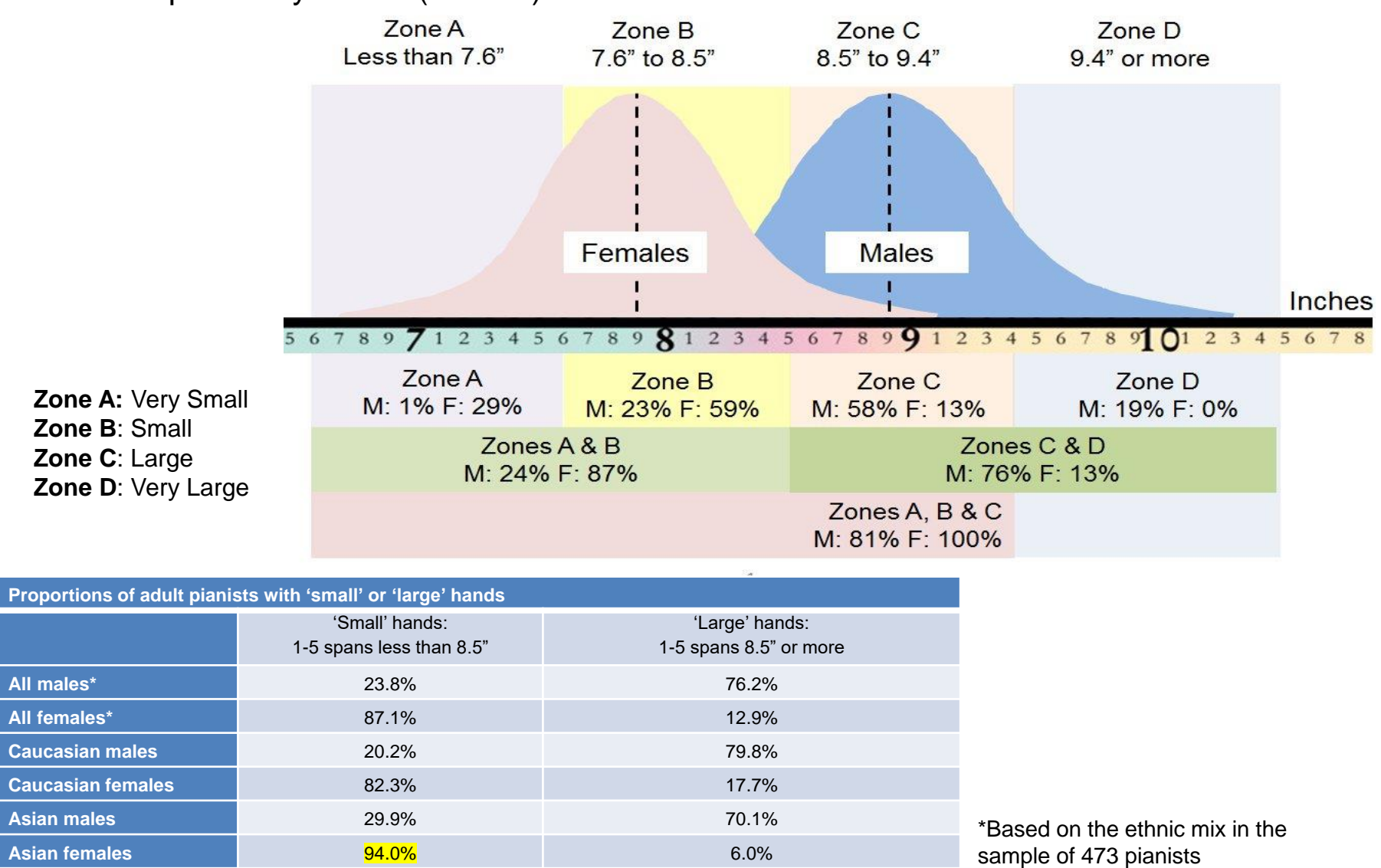
### Adult RH 1-5 span – showing gender difference and level of acclaim



### How many pianists have 'small hands'?

Benchmarks: 1-5 span – 8.5 inches (21.6 cm); 2-5 span – 6.0 inches (15.2 cm), based on:

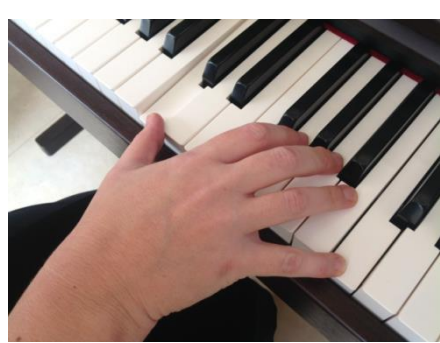
- Eliminating tension in octave playing, ability to 'just' play a 10<sup>th</sup> (1-5) and 7<sup>th</sup> (2-5), considerable anecdotal evidence from pianists who have experienced ergonomically scaled piano keyboards (ESPKs).



### An 'average' female hand on different sized keyboards....

#### Octaves

- On standard (6.5 inch octave) keyboard →
  - Pain & tension builds up in long passages
  - Excess forward & backward movement from black to white, with fingers near front of white keys
  - Legato octaves generally not possible.
- On DS5.5® (approx 7/8 normal width) →
  - Tension and pain due to mismatch between hand span and keyboard is eliminated
  - Can achieve legato octaves
  - Greater power and dynamic control
  - Equivalent position to 'average' male adult.



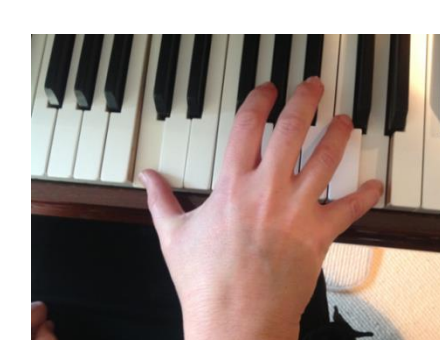
#### Ninths

- On standard (6.5 inch octave) keyboard →
  - Can only be played on extreme front edge.



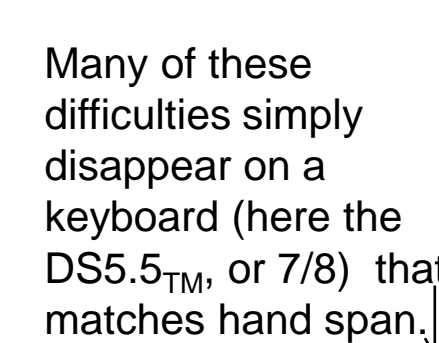
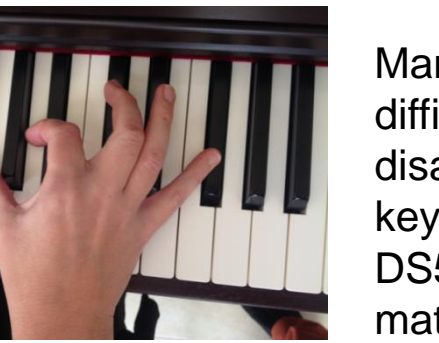
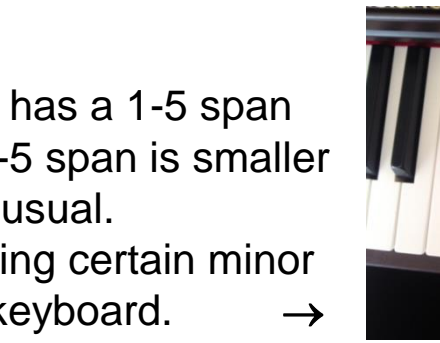
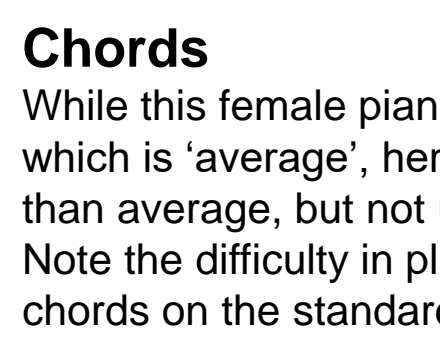
#### Tenths

- On standard keyboard → Cannot play a tenth at all.
- On DS5.5® (approx 7/8 normal width) →
  - Can play a 10<sup>th</sup> on the 'edge', equivalent to the 'average' male adult.



#### Chords

- While this female pianist has a 1-5 span which is 'average', her 2-5 span is smaller than average, but not unusual.
- Note the difficulty in playing certain minor chords on the standard keyboard. →
- A limited 2-5 span causes widespread problems with playing fast chordal passages, broken chords and arpeggiated figures, including:-
  - the extreme difficulty of leaping on to chords with fingers stretched into awkward positions
  - excessive lateral hand movement to reach notes and lack of legato when needed, and
  - the frequent changes of hand position.



## 5. Strong anecdotal evidence

Evidence comes from many pianists who have difficulties with certain repertoire and/or have tried alternative sizes, in particular men and women with 1-5 spans below 8.5 inches. Those with spans between 8.5 and 9 inches (mainly men) also find advantages with certain 'stretchy' repertoire – greater comfort with 9ths and 10ths, better control of dynamics etc. Some famous pianists (Ashkenazy, Barenboim, De Larrocha) most probably have (or had) spans in this range – when they say they have 'small hands' they really mean 'small compared to many male concert pianists'.

Some quotes from pianists and teachers:-

'I thus began the great discovery of what it feels like to play the piano with larger hands. It was like an epiphany. All the touches and techniques in piano studies – and I stress ALL of them – were made easier by a factor of a hundred.' (Christopher Donison, Executive Artistic Director, Music by the Sea, and co-inventor of DS keyboards, British Columbia, Canada, 1998.)

What a revelation! What unalloyed joy! For the first time in my life my hand fell properly on a full octave with no stretching. I could get a 9th with the same slight stretching I had with an 8th, a 10th was even possible. Chords also felt natural and relaxed - as they should be!...I could execute scales and arpeggios cleanly and with minimal adjustment. Soon I was playing with a smooth and confident touch. I was so excited and happy I do believe I teared up a bit, so many thanks to you [Dr Carol Leone] and David Steinbuhler for this opportunity.... As an engineer I learned the first law of ergonomics is never try to adapt a human being to the machine - you adapt the machine to the human being. Your efforts are helping to eliminate unnecessary pain, adding years to a pianist's playing life, and - greatest of all - opening up so much glorious music hitherto closed to those of us with smaller hands.' (Jon Bromfield, Arizona, 2015).

'For me, the most enjoyable aspect of playing on the reduced-size keyboard is how it felt: finally I was playing on a piano that was the right size for me. It was as if I had been trying to walk around in shoes that were a size too big and then at last I got a pair that was the right size. Everything, from runs and leaps to sound and memorisation, was easier. Also, I had to spend less time working on the technical issues, which allowed me to focus more on the musical issues. My senior recital that I played on the reduced-size keyboard ... was by far the strongest piano performance I ever gave.' (Nicole Halton, New York 2009).

'Our expectation was that it might take days or weeks to adjust to this keyboard. In fact, we found that it generally takes a pianist less than an hour... Those who regularly play both keyboard sizes, as I do, are familiar with both, much as one might be if driving two family cars. Organists and harpsichordists regularly deal with this phenomenon without problems. Violinists who also play the viola experience the same type of dual ability.

I often witness pianists place their hands for the first time on a keyboard that better suits their hand span. How often the pianist spontaneously bursts into tears. A lifetime of struggling with a seemingly insurmountable problem vanishes in the moment they realise. 'It's not that big of the problem; it is the instrument!' Following on that, the joy of possibility overwhelms them.' (Dr Carol Leone, Chair of Keyboard Studies, Meadows School of the Arts, Southern Methodist University, Dallas, Texas).

'I couldn't ever get a Chopin Etude to performance level. Now I can!' (Linda Gould, Canada, 2011).

'I can now play for much longer and continue to play every day [on a DS5.5® keyboard]. I don't get frustrated from the pain and from being limited in my playing.' (Jen McCabe, Ontario, Canada, 2009).

## Barriers to change

The major barriers to change are practical and cultural rather than technological. These include:

- Lack of availability of keyboards of alternative sizes, so few pianists have experienced and therefore understand the benefits of playing a keyboard that suits their hands.
- Industry inertia and focus on the instrument rather than market testing alternative keyboards among pianists, plus the strong tie to 'tradition'.
- Incorrect assumptions and myths among teachers & pianists, including the belief that one cannot easily adapt to a different size, a smaller keyboard will 'ruin one's technique', 'good technique overcomes everything', or implying that stretching exercises can solve the problem.
- A lack of belief in a future where alternatively sized keyboards will become commonplace, with interchangeable keyboards available in concert venues. Hence, any child who might want to be a concert pianist is told they must learn to play the current 'large' keyboard.
- Assumptions about famous pianists with 'small hands' – without considering their actual hand span in relation to male and female hand span statistics, what repertoire they might have avoided, whether they suffered from pain or injury, and whether they might have reached even greater heights with a narrower keyboard.
- Unkind and selfish attitudes, such as 'using a smaller keyboard is cheating', pianists should 'just get over it' and work harder, smaller keyboards are 'toys', playing them is 'sissy', etc.
- Many pianists with small hands are discouraged from admitting that they would prefer a smaller keyboard for fear of being labelled and hence jeopardising their performing careers.
- Rationalisations such as 'I like to make things hard for myself'!

## Further Information

All references are available in a separate bibliography. This, and other hand-outs are available for download from: [www.cicadabay.com/piano](http://www.cicadabay.com/piano)

Relevant websites:  
[www.smallpianokeyboards.org](http://www.smallpianokeyboards.org)  
[www.paskpiano.org](http://www.paskpiano.org)  
[www.facebook.com/paskpiano](http://www.facebook.com/paskpiano)  
[www.steinbuhler.com](http://www.steinbuhler.com)



www.cicadabay.com/piano



www.paskpiano.org

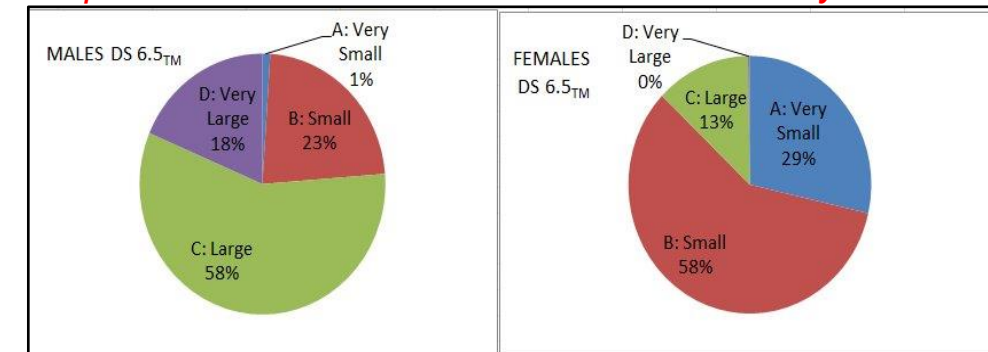
For interested technicians: [www.facebook.com/groups/TASKPiano/](https://www.facebook.com/groups/TASKPiano/)

Email: [rhonda@cicadabay.com](mailto:rhonda@cicadabay.com)

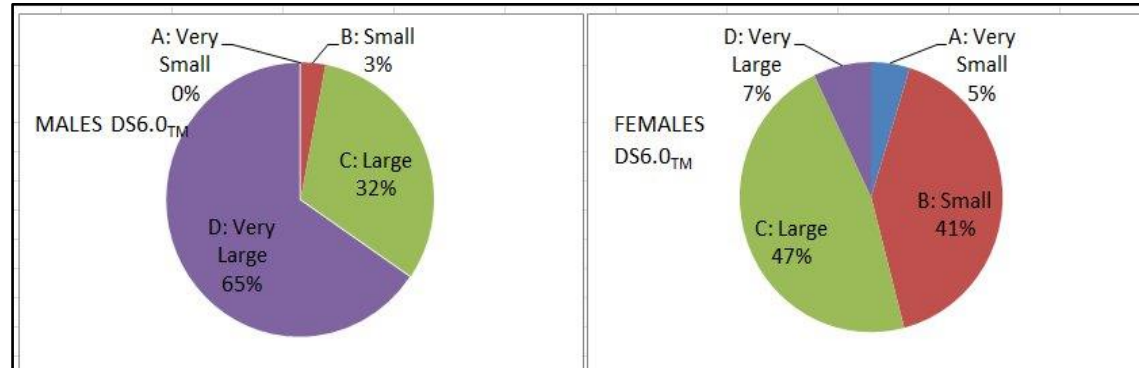
## The Future?

PASK (Pianists for Alternatively Sized Keyboards) is specifically asking piano manufacturers around the world – both digital and acoustic – to produce keyboards in three standard sizes so that purchasers of new pianos have a choice. The three sizes are the current 'large' keyboard with 6.5 inch (16.5 cm) octave, plus two smaller sizes with 6.0 inch (15.2 cm) octave and 5.5 inch (14.1 cm) octave. These sizes have been named by Steinbuhler & Co. as DS6.5<sub>M</sub>, DS6.0<sub>M</sub>, and DS5.5<sub>M</sub>.

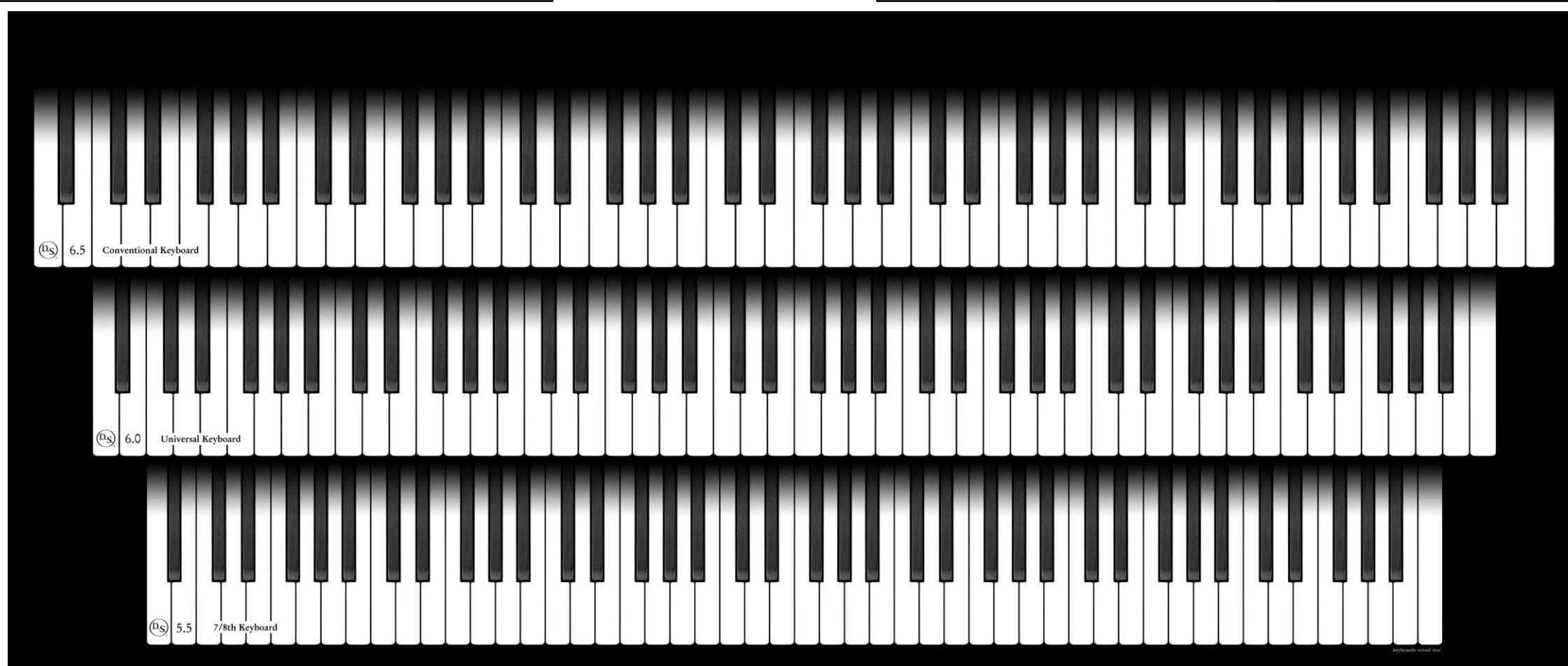
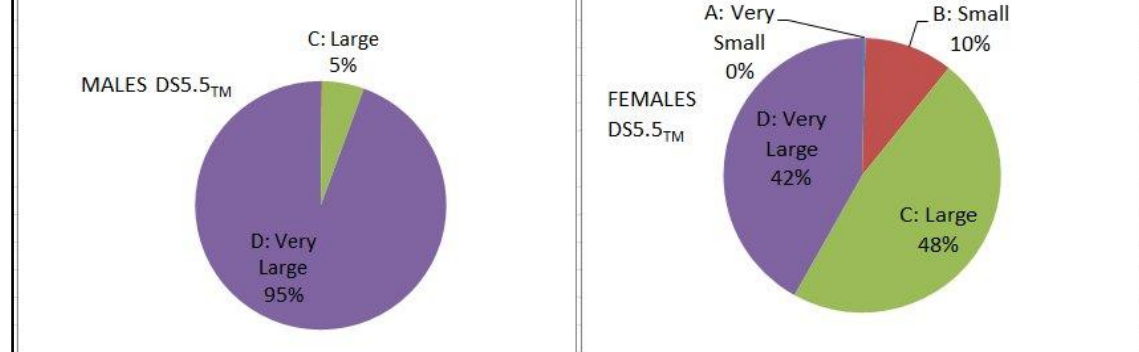
The current keyboard is 'too big' for the vast majority of women and about one quarter of men... those in the 'small' and 'very small' categories.



The DS6.0® size is still be 'too big' for nearly 50% of adult women.



Three sizes cater for the vast majority of women & children as well as men.



Where to try these keyboards? See: <http://www.smallpianokeyboards.org/resources-and-links.html>. Universities offering tuition and try-outs include Meadows School of the Arts, Southern Methodist University, Dallas, Texas. Contact Dr Carol Leone on: [cleone@mail.smu.edu](mailto:cleone@mail.smu.edu)