INVESTIGATING STRETCHINESS

Equipment:

All children: Variety of materials (cloth) of different stretchiness (e.g. cotton, wool, nylon...), tape measure or ruler; plus -

Older children: scissors, marbles, yogurt carton, string, paper clips.

Younger children: Small plastic bags, marbles, thin elastic bands.

Suggested Class Level:

All

Preparation:

All children: Collection of materials of different stretchiness; plus -

Older children: Make two holes on opposite sides of yogurt cartons.

Younger children: Make sure the elastic bands are thin enough to be able to measure the stretch after a small number of marbles are added.

Background information:

The main naturally-occurring stretchy material is rubber. In 1959 a man-made fibre called Lycra (*here*), or Spandex (*in the USA*), or Elastane (*in Europe*) was manufactured in America.

Some clothes (*e.g. leggings, swimwear*) and items of furnishings are best made from stretchy materials, whilst some are better made from materials that do not stretch. Imagine if tights did not stretch and had to be made the exact size and shape of your legs!

And what about a carpet that stretched every time someone walked on it!

Many sports people wear stretchy materials that cling tight to them, because looser material flopping around them hinders their movement.

So choosing materials of the right stretchiness can be very important.

Many things have an 'elastic limit', that is a point when they will not stretch any more but just break.

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Trigger questions:

What happens when you pull something? (*It moves towards you unless it is very heavy or is fixed to something*)

What happens when you pull something that is fixed? (*It may do a number of things – do nothing, break, stretch, etc.*)

If something stretches and you let it go, what happens? (*It goes back again to its original, or nearly original, size*).

If you stretch something really really hard what might happen it? (*It might break*).

What makes elastic useful? (*It's stretchy*)

When would you use stretchy materials? (*For gymnastics, in swimsuits and caps, tights, cycling shirts, legging, some house furnishings...*)

Stretch wetsuits:

Do you know the name of any stretchy material? (*'Lycra' is used quite often; it is woven into other materials, e.g. cotton and nylon, to make them stretchy*)

Stretching downwards:

The following could be used as a demonstration, with the description of a kind of VERTICAL TUG-OF-WAR –Gravity pulling down and the material pulling up.

If you hang a weight from stretchy material or an elastic band what will happen to the elastic band? (*It stretches downwards*)

What pulls it down? (*Gravity*)

What happens when you take off the weight? (*It goes back up again*).

What pulls it back up again? (*The upward pull of the stretchy material*).

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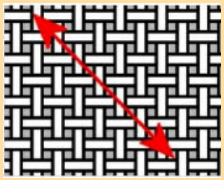
Content:	**SCIENCE:** Materials – properties and characteristics Energy and Forces
	MATHS: Number: place value: ordering (*putting the materials in order of stretchiness*), fractions, decimals, %. Measures: Length, capacity Lines and Angles (rectangles of material) Data: represent and interpret
Skills:	Predicting, Observing, Investigating, Measuring, Recording
Cross-curricular Links:	Music – stretched strings
Activities - Science and Maths	**All children:** 1. Children look at and feel the different materials and then describe them, e.g. colour, texture, possible everyday uses, etc. They should also look at them through hand lenses (*or a microscope if the school has one*). They could group them into 'natural' and 'man-made'. 2. Pairs of children are asked to push and pull equally against each other. What is the result? (*Nobody moves if the pull is equal on both sides*). Now suggest an unequal tug-of-war. What is the result? (*One side moves*).  3. Children are asked to predict which of the materials is the stretchiest and then to put them in order. They should stretch the pieces of material in both directions (*i.e. along, and at right angles to, the 'grain'*), and also diagonally (*i.e. on the bias*), and make observations.  4. Children can devise their own fair test to see which of the materials is the stretchiest. A reminder about 'fair testing' would be good here, i.e. "What will we keep the same" (*the equipment and method of measurement used, the size of the material*), "What will we change?" (*the type of material*); "What will we measure?" (*The amount the material stretches*). The following are suggested ways for older and younger children to investigate stretchiness:

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Older children:

Cut equal strips of the various materials into say 20cm. x 3cm. strips. Make a little hole at the end of the strips with a pencil (*or a darning needle*).

Unwind a paper clip to form an S-shape and hang it from the hole in the material.

Push a piece of string through the holes in the yogurt carton and make a knot in each end to form a handle.

Hang the carton from the paper clip.

(*N.B. You may have used this equipment for another DPS activity:*

'Investigating the tearing strength of paper').

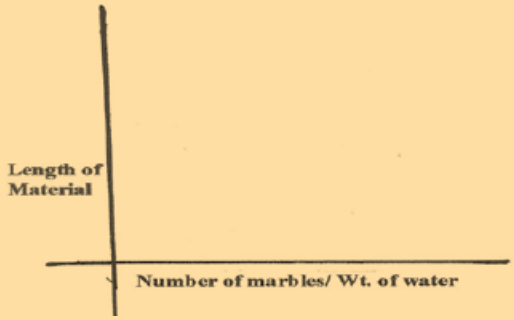
Gradually add the marbles into the yogurt carton (*this may need to be done in 2s or 5s in order to give a measurable amount of stretch*) and measure the distance which the material stretches.

They should record their results in a chart:

Number of marbles	Length of material (cm.)
0	20

A graph can then be drawn, and the children asked if there is any pattern.

An alternative method could be to use a bigger container and add water, say 50 mls. at a time, and measure the length of material each time. As before the results should be recorded, and a graph drawn and analysed.



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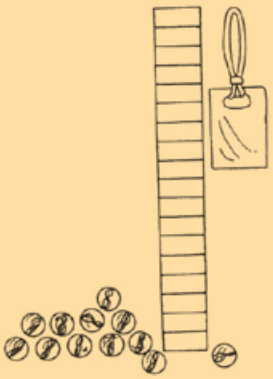
Younger children:

Attach a small plastic bag to a thin elastic band.

Add marbles to the bag (*probably 2 or more at a time to give a reasonable amount of stretch*). Measure the length of the elastic band (*to the nearest cm.*) after each time marbles are added.

The results can be put in a chart

Number of marbles	Length of elastic band (cm.)



A bar chart could be made, and the children could be asked what they notice about the chart (*e.g. they might say that they get 'equal steps' every time marbles are added*).

MORE MATHS:

1. A good deal of stretchy swimwear is made from 80% nylon and 20% Lycra. Can you express these percentages as (i) fractions (ii) decimals?

2. The material in some stretch riding pants consists of nine-tenths cotton, and one-tenth Lycra. Can you express these fractions as (i) percentages (ii) decimals?

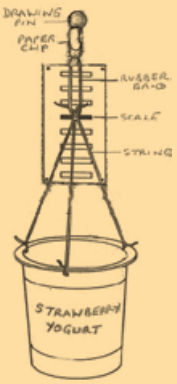
Safety:

Care with making holes in the materials.

Follow-up Activities:

1. Design and make a force meter for weighing things, using a rubber band or a spring.

In the example on the right, put some known weights in the yogurt carton, e.g. 10 gms, 20 gms etc. and mark the corresponding points on the scale. The meter can now be used to weigh small objects.



2. Can the children devise a fair test to find out which pair of tights is the stretchiest? (*Perhaps a tall friend has come and she wants to borrow a pair of tights!*).

3. The children can investigate the effect of using 2, 3 or 4 elastic bands together, in parallel, and hanging weights from them. They should predict whether more bands will be more or less stretchy than one band. They can then experiment, record, and draw a graph. Is there any conclusion?