Camborne Science and International Academy

Investigating Sports drinks: Are they worth the money?

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Introduction

Our Inspiration:

- Increasing awareness for public health.
- Increase in the consumption of sports drinks because of this.
- A noticeable increase in both advertising and price for sports drinks

- Advertisers are sending a clear message – '*athletes should replace lost body fluid with drinks that contain electrolytes'*
- Contrarily some reviews suggest some sports drinks are unhealthier due to high sugar content.
- Drinks such as water and milk may be sufficient.

Indeed it is claimed that there are no beneficial effects of sports drinks in comparison to others.

Aim of the investigation

- To compare electrolyte content of a range of drinks.
- To assess the amount of reducing sugars.
- To compare the relative cost of each drink.

- Ideally to determine if sports drinks are worth the extra cost (compared to beverages for example water or milk).

Methodology

Experiment 1

Determining the Relative Electrolyte Concentration

Theory

To determine the **electrolyte concentration** in each of the drinks, the **conductance** must be measured.

This is **proportional to the electrolyte concentration** as electrolytes are the charged particles that carry current in solution.

Conductance was determined using the following equation:

Conductance (*Siemens*) = *Current* (*Amps*) / *Voltage* (*Volts*)

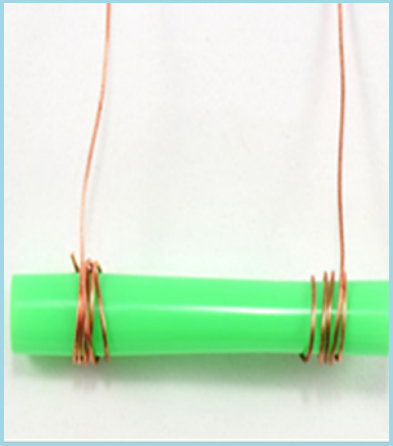
We measured the conductance of 16 drinks; 7 of which were specifically marketed as Sports drinks.

Beverages:

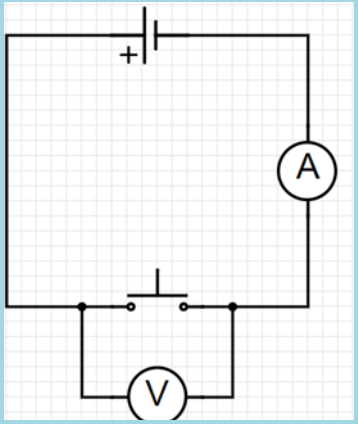
- Lucozade Fit Water
- Get More Drink
- ASDA Zero Sport
- Glaceau Vitamin Water
- Lucozade Sport
- ASDA Sports Nutrition Water
- Purdeys Rejuvinate
- Distilled Water
- Tap Water
- Coconut Water
- Skimmed Milk
- Semi Skimmed Milk
- Whole Milk
- Almond Milk
- Orange Juice
- Monster Glucose Powered

Marketed as Sports Drinks

Setting Up and Recording



- A 5 cm piece from a drinking straw was cut and 2 pieces of copper wire (each 5cm long) was wrapped tightly around each end of the straw.
- Beakers for each drink were washed rinsed thoroughly in distilled water and dried before use. A precise volume of each drink was poured into a beaker, so that the sensor was submerged to the same depth for each drink.
- The circuit was set up as shown in the diagrams.
- The conductance sensor was placed in the beaker containing first drink. The voltage was then set to 3V using a voltmeter to confirm accuracy. The current was recorded using the ammeter.
- The sensor was cleaned using distilled water and the test was repeated. For each drink 3 readings were taken at 3V, 6V and 9 V.
- Calculations were then undertaken to determine the conductance of each sample using the equation stated.
- From this a mean conductance was calculated for each drink.



Determining the Reducing sugar concentration in each drink.

- Research into the sugar content of many sports drinks have revealed that the common sugars present are fructose and glucose; both reducing sugars. They are detected using the Benedict's test.

- Standard solutions of reducing sugar concentrations were prepared (1 - 10 %).
- Benedict's reagent was added to excess and the mixture was heated in a water bath. Each solution was filtered, poured into a cuvette and placed into a colorimeter with the red filter inserted.

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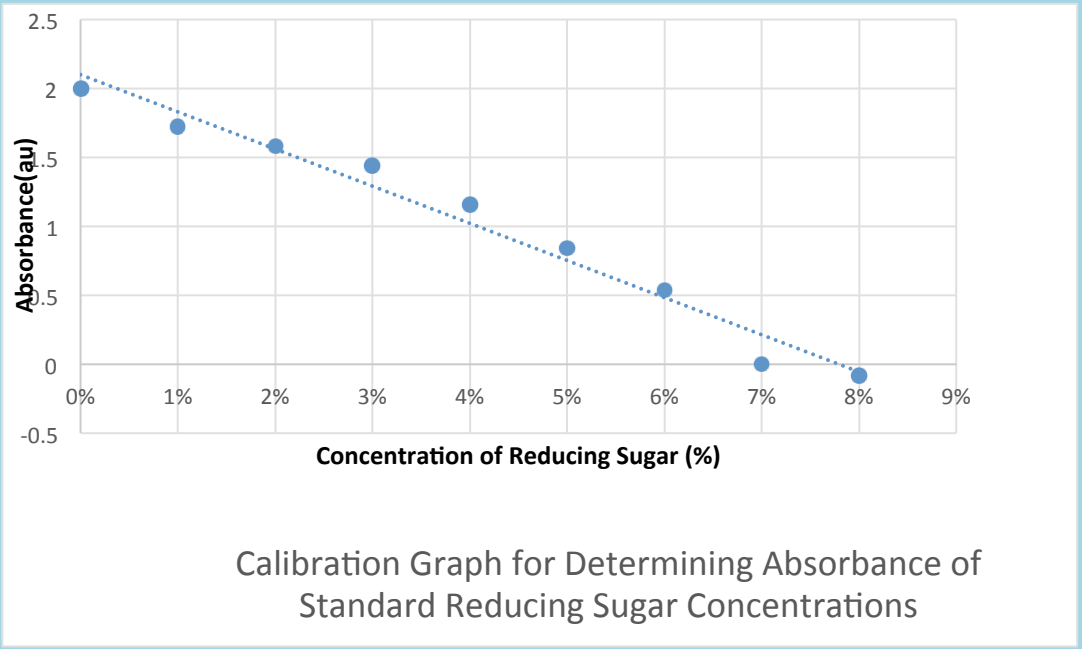
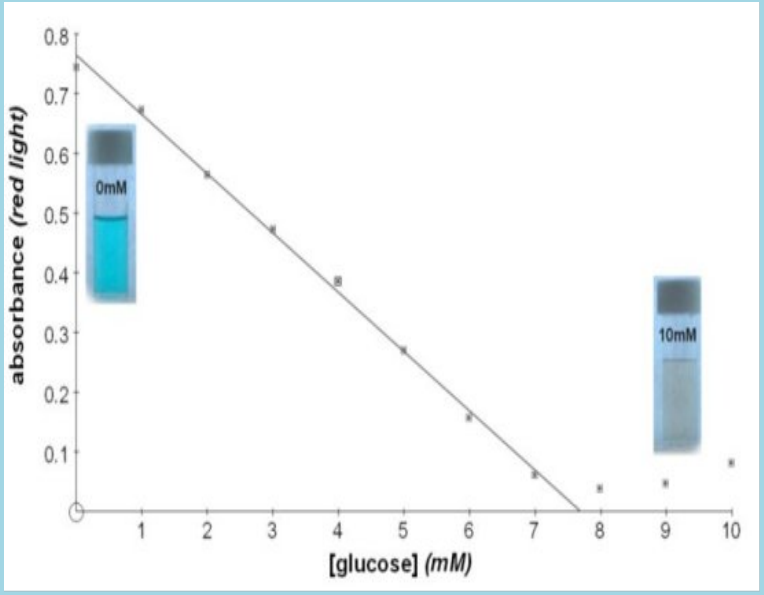
- A calibration curve was then plotted of absorbance against glucose from the standard solutions.
- Each sample of drink was then subjected to the Benedicts test and the concentrations of reducing sugar were established, by reading from the calibration curve.

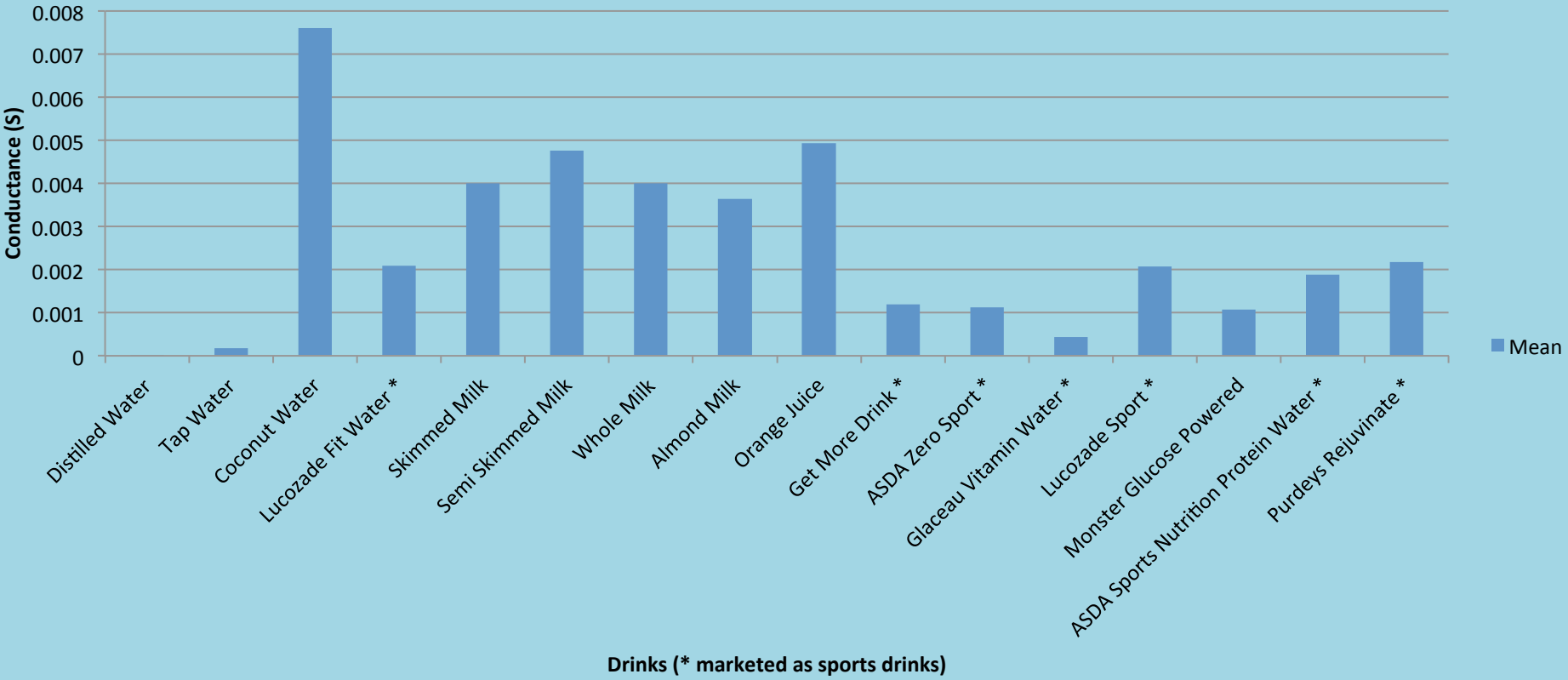


Calibration Graph for Determining Absorbance of Standard Reducing Sugar Concentrations



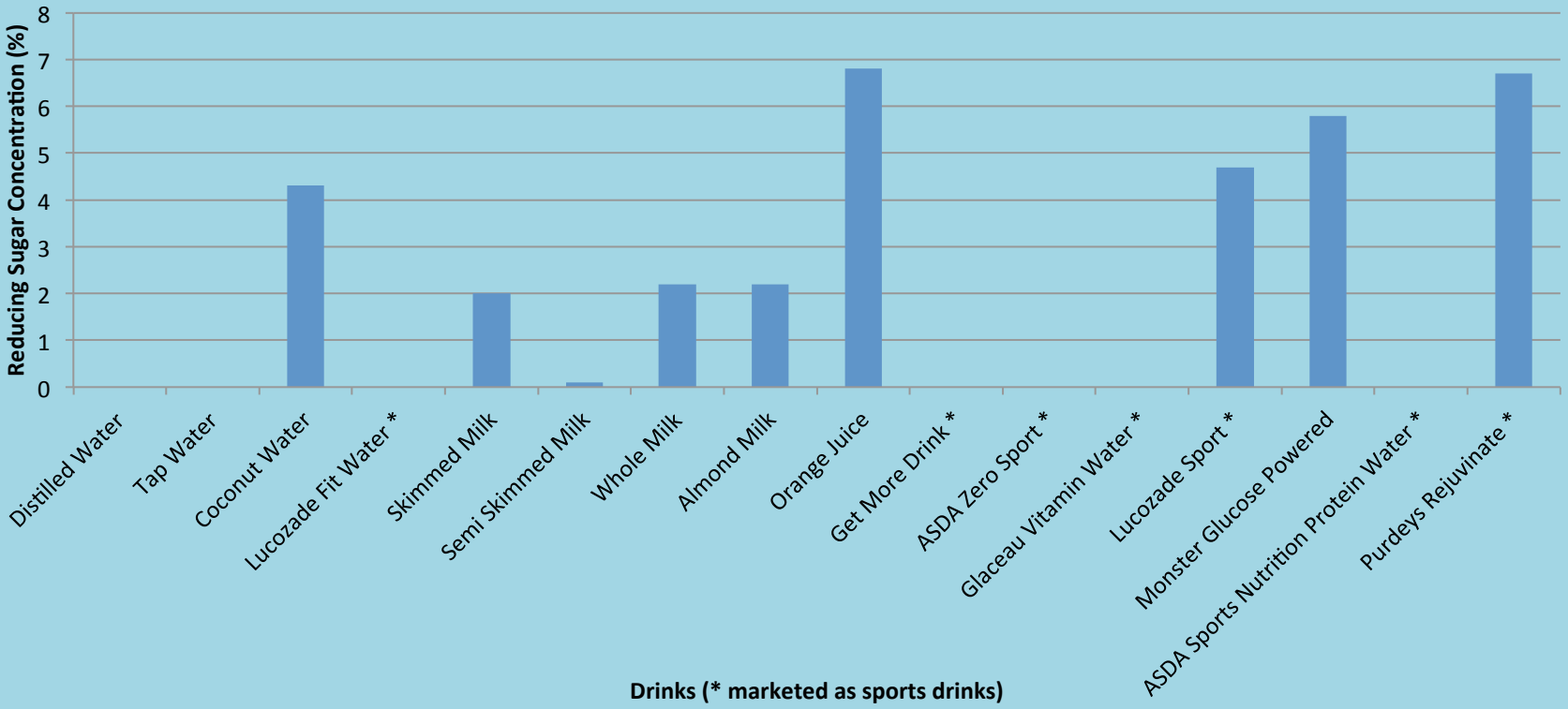
Results

Mean conductance of drinks (Relative electrolyte concentration)

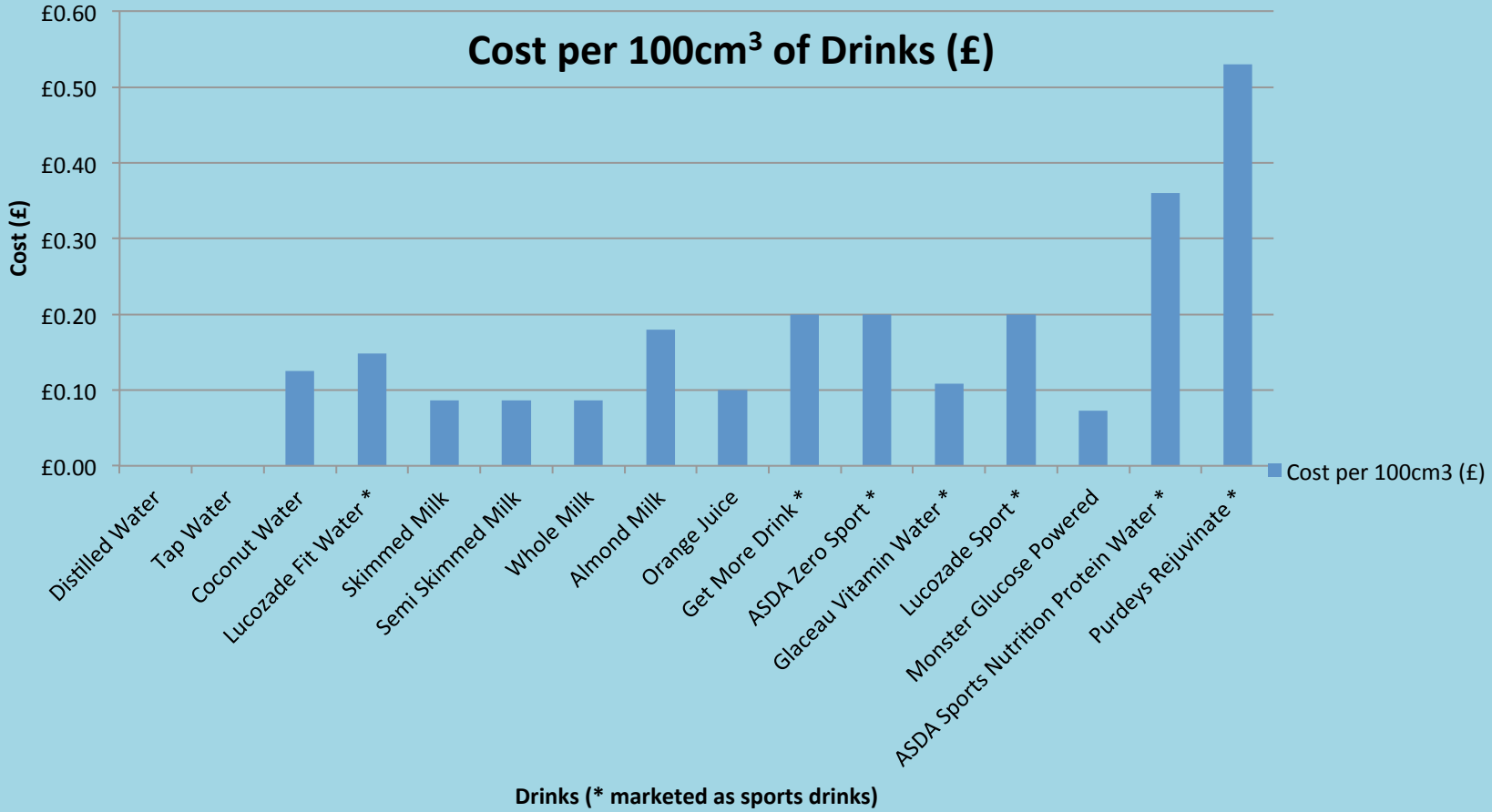


- All drinks contained a measurable electrolyte concentration.
- There was a considerable variation between them.
- Sports drinks generally had a lower concentration of electrolytes compared to all other tested drinks.
- All milk types had an electrolyte concentration which was twice that of the sports drink- . Coconut water had significantly more electrolytes than any other tested drink.

Concentration of Reducing Sugar in Drinks

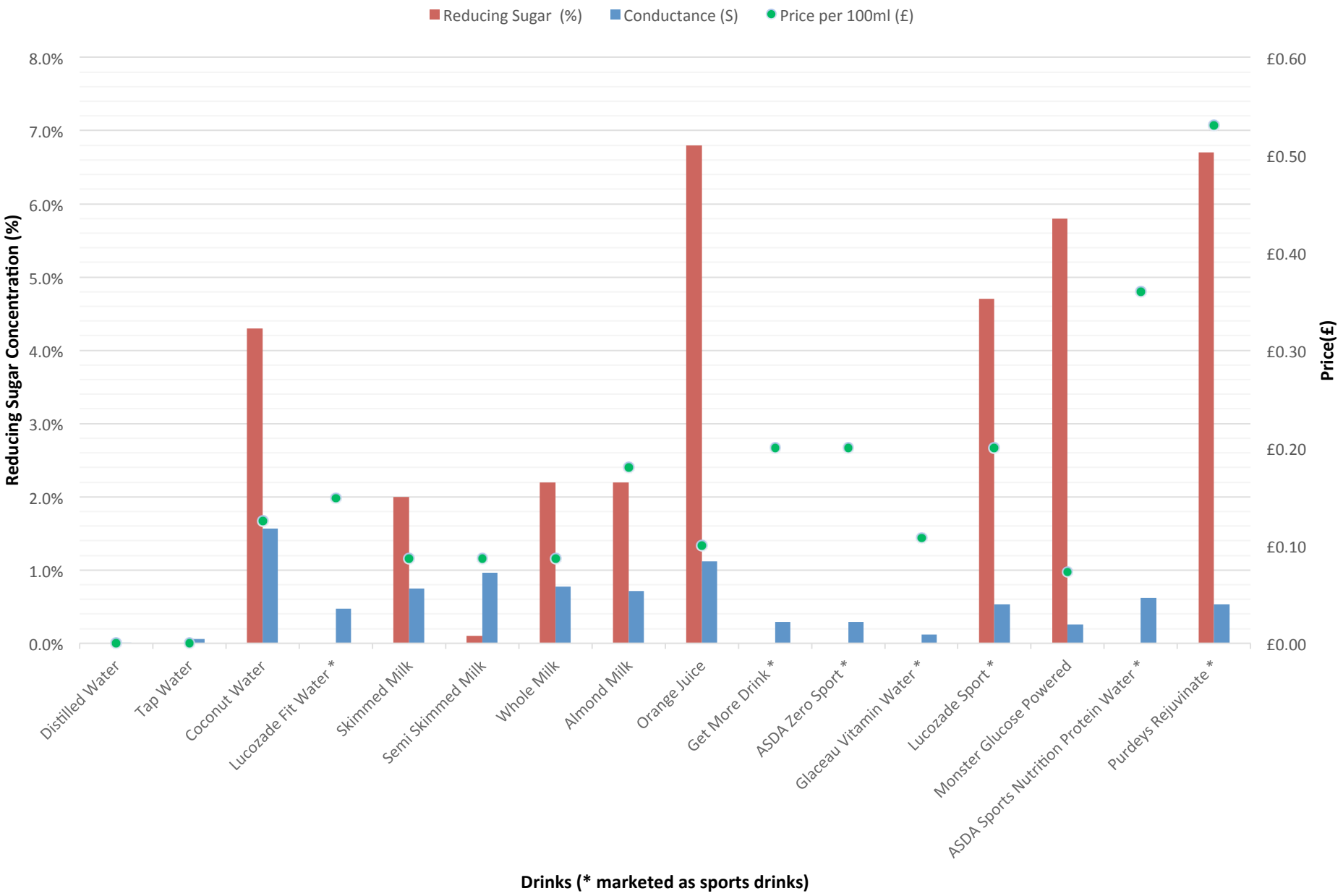


- There was a wide variation in results:
- Two of the drinks marketed as “sports drinks” had very high levels of reducing sugars, as did orange juice. (Between 5-7% sugar). This was almost x 3 that of milk.
- The other 5 sports drinks had no detectable reducing sugar concentration (although may have contained a non- reducing sugar).
- 3 of the 4 types of milk contained a low level (2%) sugar concentration.



- Drinks that are marketed as “sports drinks” were generally more expensive.
- 5 out of the 7 sports drinks tested were at least double the price (in some cases 3 or 4 x the price) of most of the other drinks.

Graph showing the price, reducing sugar content and relative electrolyte concentration in a variety of drinks



Summary: What we have learnt

Sports drinks are beverages specifically formulated to:

- Prevent dehydration.
- Provide a source of carbohydrate – the most efficient source of energy.
- Replenish lost electrolytes.

They can be:

- Isotonic
- Hypertonic
- Hypotonic

It is clear from our investigation that each drink had a different formulation in relation to this.

However when consumers are purchasing their drink do they really know what they are getting?

Is the more expensive sports drink really necessary?

Conducting literature reviews yielded some interesting observations

- *A study conducted by Cardiff University and published in the British Dental Journal highlights that parents and children are unaware that sports drinks are not intended for consumption by children. Their recommendation is that water and milk are sufficient to hydrate before, during and after exercise.*

- *Sports drinks high in sugar increase cardio - metabolic risk and contributes to tooth decay.*

- *The BMJ voiced that there was a lack of evidence to support the beneficial claims. "Indeed water was generally sufficient for shorter sessions, only for exercise lasting more than 60 mins was an isotonic sports drink recommended".*

- *Study by researchers at Harvard University found that 13% of marathon runners had suffered hyponatremia (too little Na+ in the blood). However they suggested that this was due to over-hydration. There appeared to be no difference between the athletes that consumed sports drinks compared to those that drank water.*

- *There is agreement between bottled water companies and the sports drink industry in promoting hydration; however the disagreement is about* ***what type of fluid that should be.***

- *Our natural instinct is to respond to dehydration by drinking - "thirst is a good guide for hydration" –* ***but what drink should it be?***

Returning to our own studies and research– our recommendations are:

- Sports drinks can rarely be justified in terms of both cost and benefit to health (particularly for children).
- For most exercise less than 60 mins, tap water appears to be sufficient to hydrate people.
- For more intensive exercise where electrolytes may need to be replenished and a source of energy is required, then **milk** seems a good alternative; cheaper, with lower levels of carbohydrate, than many of the sports drinks and a significant electrolyte concentration.

Future Studies

- We are aware that the potential benefit of sports drinks is a very controversial issue.
- We would like to get more involved with working with drinks companies and sports physiology departments in universities.
- We would like to take studies into the difference in blood electrolyte concentrations before, during and after exercise in a range of individuals at different durations and intensities of exercise.

Bibliography

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Thank you for listening
Any questions?

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