

## **Does 100% fruit juice impact on body weight?**

While there is generally a positive view about 100% fruit juices, some public health bodies have raised concerns about their potential impact on body weight, particularly in relation to overconsumption and sugar content. This statement will look at whether these opinions are evidence-based and justified.

### **Consumption of 100% fruit juice**

In Europe, the average daily consumption of beverages during childhood and adolescence is 1455ml, which is mostly represented by water. On average, drinks provide 1,609 kJ (385 kcal), approximately 30% of which comes from sugar-sweetened beverages, 21% of which comes from sugar-sweetened milk, and 18% of which comes from fruit juices<sup>1</sup>. Industry data show that the average intake of 100% fruit juice in Europe is just 31ml daily<sup>2</sup>, which equates to 13kcal daily, or a third of a portion of fruit. These figures suggest that concerns about overconsumption are misplaced. Even if daily intakes rose to 150ml – the amount that equates to one portion of fruit in some European countries – daily energy intake from 100% fruit juice would only be 62kcal or 3% of the Reference Intake (2000kcal).

### **Does fruit juice impact on adult body weight?**

Findings on this topic are inconsistent, mainly because differing approaches have been used. Studies often do not differentiate between 100% fruit juice and juices with added sugars or syrups. In most studies the control is represented by the consumption of sugar-sweetened carbonated drinks.

Few studies have considered the specific impact of 100% fruit juice on adult body weight and the literature is dominated by observational data which cannot determine cause and effect. The outcomes of these studies have varied from positive correlations between adult weight gain, albeit clinically insignificant amounts, and 100% fruit juice intake<sup>3,4</sup> to inverse associations between body mass index, waist circumference and 100% fruit juice intake<sup>5</sup>. Both of these secondary analyses were in US populations. A study of a large European cohort reported no association between the combined intake of 100% fruit juice and fruit nectars and body mass index<sup>6</sup>. A similar finding was seen in the Food4Me survey of European adults from seven different countries<sup>7</sup>.

This confusing picture is probably explained by the nature of epidemiology which is highly susceptible to confounding by other behaviours. Indeed, fruit juice consumption tends to be statistically associated with beneficial health behaviours such as reduced alcohol consumption, not smoking and increased physical activity. Overall, if fruit juice intake is not excessive and is part of a balanced diet, there appears to be very little evidence of an increased risk of obesity.

Turning to the few randomised controlled trials that are available, these tend to show no impact on weight management, even at intakes up to 500ml daily. The authors of a recent review on citrus fruit juices concluded that “Based on clinical intervention studies, the addition of orange juice or grapefruit juice to a habitual or study diet did not result in weight change, suggesting that individuals likely compensated with other dietary choices”<sup>8</sup>. A similar finding was seen in a 2017 randomised controlled trial in which 500ml of orange juice was consumed daily for 12 weeks as part of calorie-controlled diet<sup>9</sup>.

The sugars content of 100% fruit juice has come under scrutiny with respect to weight gain and risk of obesity. These sugars come directly from the fruit used to make the juice – sugar is never added to 100% fruit juice by law. Following a substantial systematic review, a team of researchers commissioned by WHO concluded that excess calories were responsible for weight gain, not sugars specifically<sup>10</sup>. Therefore, when energy intake is balanced with energy expenditure, dietary sugars from fruit juice do not increase the risk of excess weight gain.

### **Fruit juice consumption and weight in children**

Data from 12 of the 19 studies identified in the literature failed to show a significant correlation between habitual consumption of fruit juices and BMI, or variations in body weight over time. Three studies reported that, as consumption of 100% fruit juices increased, the risk of developing overweight and obesity statistically and significantly decreased; whilst three other studies showed a significant correlation between consumption of fruit juices and weight gain. However, consumption levels in these studies were particularly high and included drinks other than 100% fruit juice (e.g. diluted fruit juice, syrups, flavoured mineral juices and sports drinks). One study showed that higher juice consumption levels were only associated with a further risk of weight gain in children who were already overweight or predisposed to it.

Conversely, more frequent provision of fresh fruit was associated with a lower increase in body weight<sup>11</sup>. A 2016 systematic review confirmed this finding by reporting that 22 studies in children and adolescents found no significant associations between consumption of 100% fruit juice and weight/adiposity after controlling for energy intake<sup>12</sup>. A 2017 meta-analysis of 8 prospective studies involving more than 34,000 children found no statistical or clinical association between 100% fruit juice consumption and body mass index z scores<sup>13</sup>.

### **Effect of pre-loading with 100% fruit juice**

Studies comparing the effects of pre-loading based on fruit or fruit juice have shown that pre-loading in liquid form leads to a higher energy intake in the subsequent meal<sup>14</sup>, although in some cases, this difference is not statistically significant<sup>15</sup> or no difference is found at all between solids and liquids<sup>16</sup>. The tendency towards overweight/obesity particularly in children is thought to be due to a lack of compensatory reduction of energy intake in the meal following pre-loading with calorie-containing drinks (including fruit juices). However, the effects of pre-loading were found to be similar with fruit juice compared with yoghurt to which fruit pieces had been added<sup>17</sup>. In obese children, energy intake in the following meal

appeared to be about 15% lower after consumption of a pre-load based on skimmed milk or apple juice compared with a pre-load based on water alone<sup>18</sup>.

### Effects on satiety

Where food type is equal, pre-loading in solid form often leads to a lower energy intake in the subsequent meal compared with liquid form. One study found that pre-loading with apple slices or apple sauce reduced the amount of energy consumed afterwards to a greater extent than pre-loading with apple juice<sup>19</sup>. Some studies have demonstrated that fibre-enriched juices are more filling<sup>20,21</sup>. Regardless of the type of pre-loading (solid, semi-solid, liquid), the resulting energy intake seems to be offset by a reduced energy intake in the subsequent meal.

### Conclusion

Despite concerns, 100% fruit juice is not overconsumed in Europe and even increasing intakes to 150ml per day, on average, would have a minimal impact on energy intakes.

Observational evidence on the impact of 100% fruit juices on overweight/obesity in adults is sparse and provides mixed conclusions. However, in many of these studies, 100% fruit juice is combined with sugar-containing drinks which gives a false picture. Randomised controlled trials suggest no impact of pure citrus fruit juices on body weight, even at intakes of up to 500ml daily for 12 weeks.

Studies in children and adolescents mostly point to a lack of an association between the consumption of fruit juices and risk of overweight/obesity.

### References

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