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# **Secondary school students and caffeine: Consumption habits, motivations and experiences**

A thesis presented in partial fulfilment of the requirements of the degree of

Master of Science

In

Nutrition and Dietetics

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# ABSTRACT

**Background:** Recently, concerns have been raised about adolescent caffeine consumption due to its potentially serious physiological and psychological effects. Adolescents are vulnerable to the effects of caffeine due to their lack of habituation, smaller body mass and changing brain physiology. Increasing independence also exposes adolescents to new caffeinated products and provides greater freedom in their food and beverage decision making. The motivations that drive caffeine intake among adolescents are not well understood, but they are important in order to develop and implement public health strategies to reduce any harmful behavioural patterns and potential adverse effects. Therefore, it is important to determine which groups of adolescents if any are at increased at risk of caffeine-related harm, particularly as previous studies investigating adolescent caffeine intake are limited and outdated, especially within the New Zealand context.

**Aim:** The aim of this study is to explore the caffeine consumption habits of New Zealand adolescents 15 to 18 years; the factors that motivate consumption and reasons for avoiding caffeine, over a range of caffeinated products.

**Methods:** A previously validated caffeine consumption questionnaire (CaffCo) was administered to 217 participants 15 to 18 years via the online survey software Qualtrics.

**Results:** Most (94.9%) New Zealand adolescents consume at least one caffeinated product daily, the most commonly consumed sources being chocolate, coffee, tea and kola drinks. The median daily caffeine intake was 68 mg·day<sup>-1</sup>. Gender and employment status influence the pattern, but not overall amount of caffeine consumed. Energy drink consumption has risen dramatically over the past decade. One fifth (21.2%) of adolescents consume above the European Food Safety Authority (EFSA) safe level for caffeine intake of 3 mg·kg<sup>-1</sup>·day<sup>-1</sup>. Taste, energy and cold temperature were the main motivators for adolescent caffeine consumption. Increased energy, feeling excited, restlessness and sleep disturbances were frequently reported effects following caffeine consumption.

**Conclusions:** This study gives an updated and more detailed view of caffeinated product consumption among New Zealand adolescents. A subset of adolescents consumes caffeine above the EFSA safe level and may benefit from public health strategies to reduce caffeine-related harm. Potential strategies may include education

to improve “caffeine literacy” and improved regulations for labelling and advertising.

**Key words:** caffeine, adolescents, energy drinks, adverse effect, New Zealand

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## LIST OF ABBREVIATIONS

ADHD – Attention Deficit Hyperactivity Disorder

BMI – Body Mass Index

CaffCo – Caffeine consumption habits questionnaire

DSM 5 – Diagnostic and Statistical Manual 5

EFSA – European Food Safety Authority

FDA – US Food and Drug Administration

RTD – Ready to drink (alcoholic) beverage (i.e. alcoholic spirit with a mixer such as bourbon and kola)

WHO – World Health Organisation

$\text{mg}\cdot\text{day}^{-1}$  – Unit for milligrams consumed per day

$\text{mg}\cdot\text{kg}^{-1}\cdot\text{day}^{-1}$  – Unit for milligrams consumed per kilogram of body weight consumed per day

# 1 CHAPTER 1: INTRODUCTION, AIM AND OBJECTIVES

## 1.1 Background

Globally, caffeine is the most frequently consumed mental stimulant. Worldwide, at least 70% of people regularly consume caffeine, including 71 to 96% of New Zealanders over 15 years of age (Keast, Lieberman, & Fulgoni, 2015; Thomson, Campbell, Cressey, Egan, & Horn, 2014). Internationally, there have been recent concerns about the caffeine intake among children and adolescents, with countries such as the UK looking to limit the sale of energy drinks to those over the age of 16 due to concerns about the sugar and caffeine intake (Childhood Obesity Team, 2018). At present it is unclear whether caffeine consumption among New Zealand adolescents is a concern and whether similar steps should be followed to limit sale of highly caffeinated products (such as energy drinks, coffee and tea) to those under the age of 18.

Caffeine occurs naturally in tea, coffee and chocolate and may also be synthetically produced and added to other foods, beverages and medications including soft drinks, alcoholic drinks, sports supplements and pharmaceuticals (Fredholm, 2011). Low-to-moderate doses of caffeine generally result in the cognitive effects associated with caffeine intake including improved alertness, reaction time, cognitive function and mood (Seifert, Schaechter, Hershorin, & Lipshultz, 2011; Temple et al., 2017; Temple, Dewey, & Briatico, 2010). Individual responses to caffeine intake vary depending on genetic and environmental factors including age, gender, medication use, smoking status and previous tolerance to caffeinated products (Temple, 2009; Yang, Palmer, & de Wit, 2010). However, the effects of caffeine are dose dependent and large doses of caffeine are associated with increased negative effects of intake such as anxiety, jitteriness, insomnia, tachycardia and death in both adolescents and adults (Seifert et al., 2011; Temple et al., 2010; Thomson et al., 2014).

Caffeine intake is of concern in adolescents as is a critical developmental period during which the brain undergoes significant remodelling during this time; this includes restructuring the prefrontal cortex which is involved with behavioural control and reflective thinking (Gogtay et al., 2004; Van Batenburg-Eddes, Lee, Weeda, Krabbendam, & Huizinga, 2014). During this developmental period, caffeine consumers

may be more vulnerable to the negative effects of caffeine. Furthermore, it is important to understand adolescent caffeine choices during this period as they are likely to change. Adolescents are in a period of transition between the parental control of food choices and as individuals develop their future food and beverage intake patterns. Middle adolescence (14 to 16 years) in particular is the period where peers may have a strong influence on each other's food choices, and where adolescents may start consuming caffeinated products because of peer pressure (Story, Neumark-Sztainer, & French, 2002).

In adults, a moderate caffeine intake of up to 400mg/day is generally recognised as safe by the United States Food and Drug Administration (FDA) (Temple et al., 2017). There is less consensus around safe levels for caffeine intake in children and adolescents. Suggested upper limits of intake vary between Health Canada's recommendation of 2.5 mg/kg body weight/day (Nawrot et al., 2003) and the European Food Safety Authority limit of 3 mg/day (2015). Beyond these levels, adolescents are more likely to experience the negative effects of caffeine consumption (Seifert et al., 2011).

Worldwide, caffeine intakes by adolescents vary between 30.04 mg·day<sup>-1</sup> (0.52 mg·kg<sup>-1</sup>·day<sup>-1</sup>) in South Korea (Lim, Hwang, Choi, & Kim, 2015) and 149.20 mg·day<sup>-1</sup> (2.45 mg·kg<sup>-1</sup>·day<sup>-1</sup>) in Europe (Zucconi et al., 2013). A previous national study estimated the caffeine intake of New Zealand adolescents (13 to 19 years) at 82 mg·day<sup>-1</sup> (1.2 mg·kg<sup>-1</sup>·day<sup>-1</sup>). This estimate is however based on caffeine intakes reported in the 2008/2009 Adult Nutrition Survey and did not include energy drinks as these were not widely available in the New Zealand market at that time (University of Otago and Ministry of Health, 2011). As estimates of caffeine intake are a decade old and there have been significant changes in the availability of caffeinated products in this time, updated estimates with a specific focus on adolescent caffeine intake is needed to determine the level of risk.

The lack of clarity around safe levels of consumption, and difficulty in determining how much caffeine they are consuming, leaves adolescents vulnerable to the risk of excessive caffeine intake (overdosing). Caffeine overdoses are uncommon but can have serious consequences (McCarthy, Mycyk, & Deslauriers, 2008; Seifert et al., 2011). In severe cases, hospitalisation may result from excessive caffeine intake with an average of one death per year due to overconsumption of caffeine in the US (Seifert et al., 2013). Similarly, in New Zealand the National Poisons Centre received 82 reports of caffeine intoxication between 2005 and 2009 with over three quarters of

these related to energy drinks and/or caffeine tablets (Thomson et al., 2014). These products are easily accessible to New Zealand adolescents and therefore pose a potential ongoing health risk.

Additionally the link between caffeine (specifically energy drink usage) and increased rates of other negative health behaviours such as sensation seeking, depression, irregular sleep and use of illicit drugs such as marijuana and cocaine pose further risk (Arria et al., 2010; Azagba, Langille, & Asbridge, 2014; Faris, Epuru, Al-Shimmari, & Al-Shammari, 2015; Terry-McElrath, O'Malley, & Johnston, 2014). Even though these risks commonly arise during adolescence, caffeine may enhance the effects or lead to increased risk. More information is needed to determine whether this pattern occurs in New Zealand, as this is a potentially at-risk group that may benefit from caffeine related risk reduction interventions. Internationally, there has been limited research into the variations in caffeine intake by gender in this age group. The current evidence suggests male students have a higher consumption of energy drinks than females (Azagba et al., 2014; Nowak & Jasionowski, 2015; Temple et al., 2010); but total caffeine consumption has not been examined. A study of Croatian high school students found no difference in total caffeine consumption between males and females when adjusted for body weight (Valek, Laslavic, & Laslavic, 2004). It is important to understand if there are differences in the types or amounts of caffeine consumed by New Zealand adolescents. Employment status may also affect caffeine intake as adolescents may start to have disposable income for the first time. Evidence related to the impact of employment status on caffeine intake is limited, however several studies suggest that intake of caffeinated products increases, with a corresponding decrease in time spent sleeping (Emond, Gilbert-Diamond, Tanski, & Sargent, 2014; Teixeira et al., 2007).

Finally, while studies have been undertaken to estimate the quantity of caffeine intake among children and adolescents, there has been little focus on the driving factors behind this intake. For any public health recommendations to be made, it is important to understand the motivations for adolescents choosing these foods and beverages. Caffeinated products are not solely consumed for their physiological properties; caffeine is also consumed for social, cultural and intrapersonal reasons (Story et al., 2002). Therefore, distinctions need to be made between when caffeine is consumed as a stimulant and caffeine intake which is inadvertent when adolescents choose caffeinated products for other reasons.

### **1.1.1 Scope**

This study is a subsection of a broader study aiming to investigate caffeine consumption patterns across New Zealand. In the wider study there are two main components of data collection; the administration of an online questionnaire (CaffCo) and the collection and genetic testing of saliva samples. The present study will only examine the results of the questionnaire; specifically, caffeine intake of adolescents 15 to 18 years old, the motivations / reasons for caffeine use, and any positive or negative effects following caffeine consumption. This age group was chosen to provide comparison with the age brackets of the New Zealand Adult Nutrition Survey.

The results of this study will increase our knowledge about adolescents' caffeine consumption habits and, to support public health strategies to inform adolescents about the potential risks and rewards of caffeine intake.

## **1.2 Aims and Objectives**

### **1.2.1 Aim:**

This study aims to gain an understanding of the caffeine consumption habits of New Zealand secondary school students (15 to 18 years), the motivations for the use of various caffeinated products and positive and negative experiences with use of these products.

### **1.2.2 Objectives:**

To use a previously validated online questionnaire (CaffCo) to:

- Examine the sources and quantity of caffeine consumed per day by New Zealand secondary school students and to investigate relationships to key participant characteristics (e.g. gender, employment status and Body Mass Index (BMI)).
- Determine the primary motivations for consumption and non-consumption of caffeinated foods and beverages among New Zealand adolescents
- Investigate the perceived effects experienced following caffeine consumption by New Zealand secondary school students (both positive and negative)

### **1.2.3 Thesis Structure**

This thesis contains four key chapters with additional appendices and references.

Chapter 1 is the introduction that outlines the background, scope and justification of this research regarding caffeine consumption habits, motivations and experiences of New Zealand secondary school students. Included in this chapter are the study aims, objectives, and researcher contributions. Chapter 2 consists of a review of current literature on caffeine consumption with a focus on adolescent caffeine habits and motivations. Chapter 3 is the manuscript of the empirical data collected as part of this thesis, comprising of an abstract, introduction, methods, results, discussion and conclusions; it has been formatted for the International Journal of Adolescent Medicine and Health. Chapter 4 provides the conclusion to the thesis, outlining the strengths and limitations of the study, and presents recommendations for both future research and how the findings of this thesis may inform policy. Following this are a series of appendices containing ethics consent, the CaffCo questionnaire, as well as supplementary methods and results.

## 1.2.4 Researcher contribution

**Table 1.1 Researcher's contributions to thesis study**

<b>Contributors</b>	<b>Research contribution</b>
Sophie Turner	Principal researcher – thesis author  Research study proposal, literature review, participant recruitment, data collection, cleaning and analysis, results formulation and subsequent discussion, thesis manuscript preparation
Rebecca Tennent	Associate researcher  Aided data collection and data input and assisted with general administration of the caffeine study
Associate Professor Kay Rutherford- Markwick	Primary academic supervisor  Provided supervision for the caffeine study including the design and conduct of the study, ethics application, thesis chapter writing and manuscript preparation
Associate Professor Ajmol Ali	Academic supervisor  Provided supervision for the caffeine study including the design and conduct of the study, ethics application, thesis chapter writing and manuscript preparation
Associate Professor Carol Wham	Academic supervisor  Provided supervision for the caffeine study including the design and conduct of the study, ethics application, thesis chapter writing and manuscript preparation

## 2 CHAPTER 2: LITERATURE REVIEW

### 2.1 Introduction and history of caffeine usage

Caffeine is the most widely available psychoactive substance in the world (Nehlig, 1999). Caffeine occurs naturally in tea, coffee, and chocolate; or it may be artificially added to products such as soft drinks, energy drinks, sports gels and medications (Fredholm, 2011). Caffeine consumption is associated with its well-known cognitive effects including decreased tiredness, improved alertness and cognitive function (Seifert et al., 2011; Temple et al., 2017). However, negative consequences of caffeine consumption including difficulty sleeping, anxiety, jitteriness, tachycardia and in rare cases, death may also occur (Temple et al., 2010). As caffeine is consumed by approximately 80% of people worldwide, any positive or negative effects of consumption are widely felt (Ogawa & Ueki, 2007).

Several cultures appear to have independently discovered the stimulatory benefits of caffeine from different sources: Asia (tea), Africa/Middle East (coffee) and South America (chocolate and mate) (Fredholm, 2011). Caffeine may also be synthesised and used as an additive in foods, beverages and medications including soft drinks (kola drinks (NB. the term kola is used to differentiate between the flavour and the brand *Coca-Cola*) contain added caffeine as a flavour enhancer), alcoholic drinks, sports supplements and pharmaceuticals (Thomson & Schiess, 2010). For many cultures the consumption of tea, coffee or chocolate is more associated with taste, habit or as a drink to have in social settings than the properties of the caffeine itself. Some people consume these products for other reasons; to stay awake, improve concentration or assist exercise performance (Nawrot et al., 2003).

Most existing caffeine research has been conducted in adults, where the effects of caffeine consumption are well documented. Less is known about caffeine consumption among adolescents, such as how much they are having and what motivates their intake of caffeinated products. Adolescents are a particular concern as they are undergoing a stage of rapid growth, development and maturation, both physically and mentally which makes them more vulnerable to accidentally consuming an unsafe amount of caffeine and its potentially serious consequences.

The aim of this research is to explore trends for adolescent caffeine consumption and compare these to worldwide patterns. Also examined are potential influences and motivating factors behind caffeine use, and the potential positive and negative

consequences following consumption as well as highlight limitations of existing research and suggest directions for future research.

## **2.2 Caffeine metabolism**

Caffeine is rapidly absorbed from the gastrointestinal tract (Fredholm, 2011; Nawrot et al., 2003), with peak plasma caffeine concentrations being reached within 1 to 1.5 hours of ingestion. During this time the greatest physiological effects are expected, before being eliminated by the liver with an average half-life of 5 hours (range approximately 3 to 7 hours) (Heckman, Weil, & De Mejia, 2010; Nawrot et al., 2003).

Individual responses to caffeine vary with genetics and environmental factors. Age, gender, medication use (including use of oral contraception), pregnancy and smoking status affect caffeine intake and rate of elimination from the body (Nawrot et al., 2003). Studies using twins have shown there is a strong genetic component to an individual's experiences with caffeine, specifically caffeine intake and effects including caffeine intoxication tolerance, withdrawal and sleep disorders (Yang et al., 2010). Hence some people will be more sensitive to the effects of caffeine than others, and what constitutes "a safe level" of consumption may not apply to everyone.

Caffeine has a range of effects, both beneficial and harmful to consumers and the effects are dose dependent. Low to moderate doses of caffeine (in adults between 200 and 300 mg day<sup>-1</sup>) are associated with mostly positive effects such as those related to cognition, reaction time, exercise endurance, improved attention and improved mood (Seifert et al., 2011). Higher doses (greater than 400 mg day<sup>-1</sup> in adults) have been associated with an increased likelihood of experiencing negative side effects including anxiety and jitteriness, as well as more serious effects such as insomnia, tachycardia, seizures and death (Seifert et al., 2011). Studies in children and adolescents have found similar physiological and psychological effects to caffeine consumption as in adults, although at lower doses (Temple, 2019). However, there is less evidence related to the safe level of caffeine intake in children and adolescents and further safety studies are needed to provide clear, international guidelines about the level of consumption in younger people.

## 2.3 Development of adolescent eating patterns

Adolescence is a developmental period initiated by hormonal changes at the start of puberty which results in extensive remodelling of the brain (Gogtay et al., 2004; Van Batenburg-Eddes et al., 2014). One of the primary areas of development during this time is the prefrontal cortex which is involved with cognitive functions such as executive functions which allow an individual to develop behavioural control and reflective thinking (Gogtay et al., 2004). Therefore, as adolescence is a crucial development period, caffeine users may have a heightened level of exposure to any negative effects of caffeine, particularly as sleep quality is compromised and sleep is vital for brain development (Temple, 2009).

On a social level, adolescence marks the transition between food and beverage choices being dictated by parents and the autonomy of decision making that adulthood represents. Patterns of food and beverage intake that are established during the adolescent years lay the foundation for lifelong patterns.

Story et al. proposed a model of adolescent eating behaviours that has four levels of influence on eating patterns; individual, social environment, physical environment and societal (Story et al., 2002). The individual level examines the intrapersonal reasoning for food choices, in the context of caffeine this may come down to a biological feeling of fatigue or taste preferences that cause an individual to choose one product over another. The social environment is especially important in middle adolescence (14 -16 years) as this is a period during which people in this age group are heavily influenced by their peers as parental influence on food choice begins to decrease (Story et al., 2002). Kendler, Schmitt, Aggen, and Prescott (2008) suggested that there is a strong familial influence on caffeine consumption during late childhood, but that this largely disappears by age 13. However, a Canadian focus group study of students (mean age  $15.1 \pm 1.3$  years) had students reporting parental consumption of drinks such as coffee made them feel that this was safe to consume (Turton, Piché, & Battram, 2016). The physical access and availability of caffeinated foods and drinks will also have an impact on food choice. Adolescents chose products that were conveniently located and affordable to them (Turton et al., 2016). Disposable income, either from parents or working a part or full time job, allows adolescents to purchase caffeinated products that are perceived as expensive such as energy drinks or caffeinated ready-to-drink alcoholic beverages (RTDs) (Faris et al., 2015). The effects of disposable income and employment status on caffeine intake have not been well explored, but one recent

study found those who attended school had a lower caffeine intake than adolescents in part or full time employment (Emond et al., 2014).

Finally, societal expectation as to the types of food and drinks an adolescent is supposed to consume influences caffeine intake, for example energy drinks are marketed mainly towards adolescent and young adult males and it is proposed that this results in the trend of significantly higher energy drink intake among boys and young men (Azagba et al., 2014; Reissig, Strain, & Griffiths, 2009). Therefore, from a public health perspective, adolescence is a critical time to intervene in any problematic caffeine consumption issues. In the absence of intervention, unhealthy caffeine consumption patterns developed during teenage years are likely to persist throughout adulthood (Von Post-Skagegård et al., 2002).

## **2.4 Effects of caffeine consumption**

### **2.4.1 Cognitive effects**

Caffeinated foods and beverages are commonly consumed for their effects on mood and cognition when individuals are tired or sleep deprived (Bunting, Baggett, & Grigor, 2013). Moderate caffeine intake (200 mg – 300 mg) in adults has been found to result in short-term improvements in cognitive function, reaction time, memory and alertness 1 to 2 hours after consumption (Temple et al., 2017). Similar results have been found in children and adolescents, namely that acute caffeine administration results in increased alertness, motivation, talkativeness and energy in doses between 50 – 200 mg (Heatherley, Hancock, & Rogers, 2006; Temple et al., 2010).

Among young adolescents in the Netherlands it has been shown that consumption of one or more energy drinks per day was associated with increased problems in self and parental reported behavioural regulation and metacognition (Van Batenburg-Eddes et al., 2014). This study found daily consumption of at least one other caffeinated drink (coffee, cola) in addition to energy drinks did not result in a “cumulative effect”, indicating that energy drinks and not total caffeine resulted in more problems with metacognition (skills involving planning, organising and future problem solving). Therefore, energy drink consumption is of particular concern for adolescents as they are developing skills which affect the brain long term and information is needed to understand the motivations for ingesting these products and how much they consume.

Mental health is also affected by caffeine intake. A study of UK secondary school

students found positive relationships between weekly caffeine intake, anxiety and depression. In this study, consumption of more than 1000 mg of caffeine per week (~143 mg day<sup>-1</sup>) predicted high anxiety, and any caffeine intake was associated with increased prevalence of depression (Richards & Smith, 2015). A Canadian study also found a dose-response pattern between the frequency of energy drink consumption and depressive symptoms as adolescents who used energy drinks more than once a month were 2.73 times more likely to have “very elevated” depressive symptoms compared to non-users and 1.95 times more likely to have “very elevated” depressive symptoms compared to those who use energy drinks once to twice a year (Azagba et al., 2014). That study however did not discriminate between more frequent consumption than once per month, and an assessment between daily or weekly usage maybe helpful to draw conclusions about this relationship.

#### **2.4.2 Behavioural effects**

There is a consistent association towards increased caffeine use and an increase in less desirable behavioural patterns in adolescents including anger and violence. Studies among Icelandic ninth and tenth graders found an increase in self-reported anger with increased use of caffeine (James, Kristjánsson, & Sigfúsdóttir, 2011; Kristjánsson, Sigfusdóttir, Allegrante, & James, 2011). Interestingly, the latter study Kristjánsson et al. (2011) also noted that the association between caffeine and long-term violent behaviour and conduct disorders was significantly stronger among girls than boys. Another study by the same group found this relationship persisted after accounting for family background, Attention Deficit Hyperactivity Disorder (ADHD) diagnosis, peer delinquency and current medication (Kristjánsson, Sigfusdóttir, Frost, & James, 2013). In adults, caffeine has also been reported to improve mood in stressful situations, when a drink containing 40 mg of caffeine was administered before a physically difficult and stressful challenge, the caffeine-consuming group showed a temporarily improved mood and reduced cortisol level (Sünram-Lea, Owen-Lynch, Robinson, Jones, & Hu, 2012). It is unclear whether the relationship between acute caffeine administration and improved mood would also exist in adolescents as there is a lack of existing research in this area.

#### **2.4.3 Cardiovascular effects**

A double-blind, placebo-controlled study in 12 to 17-year olds found a dose-dependent increase in diastolic blood pressure and decrease in heart rate with moderate doses up from 0 mg to 200 mg caffeine (Temple et al., 2010). The same study showed boys who

were high caffeine consumers ( $>50 \text{ mg}\cdot\text{day}^{-1}$ ) had a greater increase in diastolic blood pressure than low-consuming boys ( $<50 \text{ mg}\cdot\text{day}^{-1}$ ), however this relationship was not found in girls suggesting gender differences exist in caffeine response among adolescents. These responses at low doses are transient, reversible and therefore not concerning. However, at high doses of caffeine, arrhythmias, including tachycardia have been reported as a result of caffeine intoxication, should be avoided (Seifert et al., 2011).

#### **2.4.4 Effects on sleep**

Relative to both pre-pubertal children and adults, the need for sleep increases during adolescence to 8.5 – 9 hours per night as the body undergoes significant mental and physical changes, however it is estimated only about 20% of US adolescents meet this target (Carskadon, 2011). Lack of sleep may affect brain development as neural changes such as pruning of grey matter to develop the pre-frontal cortex that begins during puberty and continues to adulthood occurs while a person is asleep (Gogtay et al., 2004).

A study of Icelandic adolescents found a very strong relationship between caffeine use and daytime sleepiness, especially in girls (Kristjansson et al., 2011). Regular caffeine consumption was also associated with later bedtimes, reduced sleep depth and shorter sleep duration in children and adolescents 10 to 16 years due to reduced sleep electroencephalogram slow-wave activity (Aepli, Kurth, Tesler, Jenni, & Huber, 2015). Similarly, a Finnish study among 12 to 18 year-olds found heavy energy drink users were more likely to go to bed later than non-users and reported health complaints including headaches, irritation, fatigue and difficulty sleeping (Huhtinen, Lindfors, & Rimpelä, 2013; Koivusilta, Kuoppamaki, & Rimpela, 2016). This suggests that adolescents may use caffeine to stay up late resulting in poorer sleep quality and negative health consequences Huhtinen et al., 2013; Koivusilta et al., 2016).

Ludden and Wolfson (2010) found that adolescent caffeine use often begins in the evening, usually from the consumption of caffeinated soft drinks: 25.2% of adolescents' first caffeine use was between afterschool and 5pm, with a further 37.4% consuming them between 5 and 9pm. With the half-life of caffeine being 3 to 7 hours, initiation of caffeine intake late in the day will likely have an effect on sleeping patterns and result in the previous mentioned consequences of poor sleep quality (Nawrot et al., 2003). An Icelandic study found that after controlling for cigarette and alcohol use caffeine use was moderately related to sleepiness and strongly inversely related to academic

performance (James et al., 2011). More specifically, using energy drinks more than once a week was found to reduce school attendance and hours of sleep when compared to those who consumed energy drinks less than once per week. Therefore, those adolescents who have a higher energy drink intake are more tired than those who consume fewer energy drinks, and this goes on to affect their academic performance.

To summarise, in general, risk of serious ongoing effects related to cognition, mood, behaviour or cardiovascular health is low when adolescents have a daily caffeine intake that is low to moderate. Sleep, anger and academic performance may be impacted by regular consumption of energy drinks or having caffeine in the afternoon or evening. It is only with high increased intake that serious adverse effects of consumption may occur, and these have potential long-term impacts on the health of adolescents. Therefore, it is important to encourage minimal-to-moderate caffeine use among adolescents and understand how much caffeine they are consuming.

## **2.5 Caffeine intoxication (overdosing)**

Overdosing on caffeine, whilst uncommon, can have serious outcomes. Thomson et al. (2014) found 7% of New Zealand adolescents have experienced the effects of caffeine intoxication including “restless, nervousness, excitement, insomnia, flushed face, diuresis, gastrointestinal disturbance, muscle twitching, rambling flow of thought and speech, tachycardia or cardiac arrhythmia, periods or inexhaustibility or psychomotor agitation as serious potential adverse effects of the use of caffeine” (*Diagnostic and statistical manual of mental disorders: DSM-5*, 2013). Reported outcomes of caffeine overdose from Germany included adverse effects such as liver damage, kidney failure, respiratory disorders, agitation, seizures, psychotic conditions (Seifert et al., 2011). An average of one death was reported per year in the US from caffeine intoxication from a total of 4852 – 5696 calls made to poison centres between 2006 and 2008 (all ages) (Seifert et al., 2011). Over a similar timeframe (2005 – 2009) the New Zealand National Poisons Centre received 82 reports of caffeine-related intoxication (all ages) from intakes ranging from 4.0 mg·kg<sup>-1</sup> to 35.5 mg·kg<sup>-1</sup> (Thomson & Schiess, 2010). Of these 44 were related to the consumption of caffeine tablets (with or without other substances) and nearly a quarter (20/82) were related to energy drinks or shots (Thomson & Schiess, 2010).

Up-to-date information about caffeine intake among adolescents is crucial due to the

increased risk of unintentional excessive caffeine intake in children and adolescents due to the severity of the consequences of caffeine intoxication. Children and adolescents are more vulnerable to experiencing caffeine intoxication due to their lower body mass, and lower habitual caffeine consumption than adults (Temple et al., 2017). New Zealand children and adolescents who regularly consume caffeine build a tolerance to caffeine and can consume more without experiencing adverse effects (Temple, 2009). Thus, adolescents who do not regularly consume caffeine potentially have an increased risk of caffeine overdose as their threshold for intoxication may be lower (Reissig et al., 2009).

## **2.6 Caffeine intake recommendations for adolescents**

The US FDA has given “Generally Recognised As Safe” status to a caffeine intake of  $400 \text{ mg}\cdot\text{day}^{-1}$  in adults (Seifert et al., 2011). Guidelines about a safe level of caffeine intake for children and adolescents tend to be lower and less well-established than adult guidelines, although several countries have adopted recommendations for adolescents surrounding the use of caffeinated products. The New Zealand Ministry of Health guidelines recommend that children and young people should limit their intake of caffeinated products and energy drinks and shots are not recommended because of their high sugar and caffeine content (Ministry of Health, 2012). Guidelines from other countries are more specific, with Health Canada suggesting limiting intake to a maximum  $2.5 \text{ mg}\cdot\text{kg}^{-1}\cdot\text{day}^{-1}$  in children and adolescents (Nawrot et al., 2003) and the European Food Safety Authority (EFSA) advising that intake beyond  $3 \text{ mg}\cdot\text{kg}^{-1}\cdot\text{day}^{-1}$  increases the risk of adverse effects occurring among children and adolescents. For comparative purposes, the proposed safe level of caffeine consumption of  $400 \text{ mg}\cdot\text{day}^{-1}$  in adults is equivalent to  $5.7 \text{ mg}\cdot\text{kg}^{-1}\cdot\text{day}^{-1}$  in a 70 kg male, highlighting that children and adolescents are more sensitive to the effects of caffeine due to both their smaller size and reduced tolerance to caffeine. Guidelines for safe caffeine intake levels among children and adolescents should be based on body weight (i.e. in  $\text{mg}\cdot\text{kg}^{-1}\cdot\text{day}$ ) rather than a set limit ( $\text{mg}\cdot\text{day}^{-1}$ ) as young people are growing rapidly, and the level of caffeine intake that causes negative effects for a young girl going through puberty may not have the same effect in a post-pubertal man.

## **2.7 Daily caffeine intake**

A recent review of nationally representative studies of caffeine intake found that global daily caffeine intake across all age groups including adolescents has remained stable over the past decade (Verster & Koenig, 2018). However, global caffeine intakes among adolescents showed a large variation. At the lower end, mean caffeine intake of adolescents aged 15 to 18 years in South Korea was  $30.04 \text{ mg}\cdot\text{day}^{-1}$  ( $0.53 \text{ mg}\cdot\text{kg}^{-1}\cdot\text{day}^{-1}$ ) (Lim et al., 2015), whereas a study of European adolescents (10 to 18 years) found a much higher mean intake of  $149.2 \text{ mg}\cdot\text{day}^{-1}$  ( $2.45 \text{ mg}\cdot\text{kg}^{-1}\cdot\text{day}^{-1}$ ) (Zucconi et al., 2013). The intake of New Zealand adolescents (15 to 19 years) falls in between these values, with an intake of  $82 \text{ mg}\cdot\text{day}^{-1}$  ( $1.2 \text{ mg}\cdot\text{kg}^{-1}\cdot\text{day}^{-1}$ ) (Thomson et al., 2014). However, the New Zealand data utilised information collected in the 2008/2009 Annual Nutrition Survey and is now out of date. The New Zealand data is also limited as it did not include energy drinks, which are consumed weekly by 20% of young New Zealanders aged 15 to 19 (Maddison, Turley, Legge, & Mitchelhill, 2010). New Zealand adolescents' daily caffeine intake of  $82 \text{ mg}\cdot\text{day}^{-1}$  was higher than other countries with a similar market for caffeinated products. Australians aged 14 to 16 had a lower daily caffeine intake of  $41.7 \text{ mg}\cdot\text{day}^{-1}$  (intake by weight not available) (Beckford, Grimes, & Riddell, 2015); and Americans aged 13 to 17 had an intake between  $52 - 66 \text{ mg}\cdot\text{day}^{-1}$  ( $0.8 - 1.1 \text{ mg}\cdot\text{kg}^{-1}\cdot\text{day}^{-1}$ ) which was also lower than that of New Zealanders (Tran, Barraj, Bi, & Jack, 2016). As the most recently published caffeine intake data does not include commonly consumed caffeine source and is ten years old, updated intake data should be compared to recent international patterns, to determine whether New Zealand caffeine intake has also remained stable.

## **2.8 Gender differences in adolescent caffeine intake**

There are limited international studies that have examined the total caffeine intake of adolescents and previous studies have focused primarily on energy drink usage within this age group. Studies from Europe and North America show an overwhelming pattern of male students having a significantly higher intake of energy drinks than female students (Azagba et al., 2014; Nowak & Jasionowski, 2015; Temple et al., 2010; Terry-McElrath et al., 2014; Visram, Cheetham, Riby, Crossley, & Lake, 2016). However, this does not account for total caffeine intake as female students may have larger intakes of caffeine from other sources such as coffee. A small study ( $n= 52$ ) of adolescent caffeine consumption patterns in the USA found that while a larger

proportion of boys reported drinking energy drinks than girls, girls were more likely to drink tea than boys (Temple et al., 2010). This was consistent with a Canadian study of high school students which found boys reported a higher intake of soda ( $p < 0.05$ ) and energy drinks than girls ( $p < 0.05$ ) (Ludden & Wolfson, 2010).

Conversely, there are mixed results among studies that have investigated consumption of a wider range of caffeinated products. Studies among adolescents in Australia and the USA found that boys had a higher total caffeine intake than girls (Beckford et al., 2015; Temple et al., 2010). A Croatian study among adolescents aged 14 to 15 found that males' intake was slightly higher than females' intake; however, this was not statistically significant, and the trend was reversed when adjusted for body weight (Valek et al., 2004). However, studies of adolescents in Serbia and other research from the USA showed no differences in total caffeine intake by gender (Ahluwalia & Herrick, 2015; Milovanovic, Jakovljevic, Scekic, & Djordjevic, 2016). Therefore, whilst it seems clear that young males have a higher intake of energy drinks than young females, more research is needed to evaluate the total caffeine consumption in the diet and whether this has any implications for public health.

Furthermore, it appears that there are gender differences in the experiences adolescents have with caffeine in addition to their intake. An Icelandic study found adolescent girls reporting more negative effects of caffeine than boys including increased anger and sleepiness (Kristjansson et al., 2011). Ludden and Wolfson (2010) also found that girls were more likely to report experiencing withdrawals following cessation of regular caffeine intake and frequently reported appetite suppression as a side effect of caffeine consumption. The differences in perceived effects that result from caffeine intake may alter the amount or the sources of caffeine consumed.

## **2.9 Motivating factors for caffeine consumption**

At present, the evidence for why adolescents use specific caffeinated products is limited. Most research focuses on either total caffeine or on the use of energy drinks. A qualitative study of New Zealanders aged 16 to 21 years that examined the motivations for energy drink consumption found the expectation of energising effects was the primary reason for consumption, followed by the taste (Bunting et al., 2013). This was consistent with a Saudi Arabian study of 1006 adolescent boys which also found taste and “being energised” as the primary reason for energy drink consumption (Faris et al., 2015). As this research focused on only one caffeine source, it is unclear if these reasons would apply to other caffeinated foods and beverages. A Canadian study examining total caffeine intake among adolescents found students primarily consumed caffeine for energy provision, but taste was also an influential secondary factor in which food or beverage they chose to consume (Turton et al., 2016). A different Canadian study of ninth to twelfth graders (approximately 14 to 18 years), which asked participants about their recent caffeine use and the reasons for using caffeine, found that adolescents used caffeine to get “through the day” (energy boosting effects) (Ludden & Wolfson, 2010). This study did not report any differences between caffeine sources, and listed only four potential reasons for caffeine consumption, so further qualitative research is needed that examines the motivations of caffeine use by source and gives a wide variety of potential responses including an “other” category to understand the nuance of adolescent caffeine intake.

## **2.10 Knowledge of the effects of caffeine**

Bunting et al. (2013) found that young people (16 to 21 years) were less aware of the safety and potential negative experiences of energy drink use than older adults (22 to 35 years). One study of Canadian high school students found that adolescents lacked awareness about which products contained caffeine (for example, they were unaware that some sodas contain caffeine) and that they were unsure of the effects of caffeine (Ludden & Wolfson, 2010). This is an issue because if adolescents are unaware of which products contain caffeine, they are at risk of accidental caffeine intoxication. In contrast, a different Canadian focus group study among adolescents, found that older high school students had a good understanding of caffeine-containing products including less obvious sources such as soda and chocolate (Turton et al., 2016). They were also aware of the risk of excessive caffeine consumption citing elevated heart

rates, jitteriness and short-lived bursts of energy consumption. Therefore, the levels of caffeine “literacy” vary even within countries and improving caffeine literacy is vital to reduce risk of excessive caffeine consumption (Ali et al., 2018).

## **2.11 Influences to consume caffeine**

### **2.11.1 Advertising**

Energy drinks are marketed towards adolescents and young adults, in particular young males, with marketing campaigns that promote adrenaline-seeking activities, risk taking and adventure (Reissig et al., 2009). These advertisements are very common, with 83% of Canadians aged 12 to 24 reporting that they had seen energy drink advertisements (61.9% seeing energy drink advertisements in the past month), primarily through TV and print posters in supermarkets (Hammond & Reid, 2017). Data for that study was collected in 2014, so this may have changed with the increased prevalence of social media advertising. Several brands of energy drink market themselves as legal alternatives to illicit drugs with names such as “cocaine” and “blow” which may increase intake by adolescents trying to rebel and appear ‘cool’ to their peers and gives further strength to this theory (Bunting et al., 2013). Advertisements tend to be marketed towards boys and young men, which feeds into public perception among adolescents that energy drinks are “a drink for males” and display a “*cool, rebellious and independent*” image (Bunting et al., 2013; Costa, Hayley, & Miller, 2014).

Advertising energy drinks is an issue because several studies have found that significant relationships exist between regular energy drink consumption and non-prescription stimulant use, and that energy drink usage and persistence in the late teens were correlated with use of cocaine, stimulants and other negative health behaviours during a person’s early to mid-twenties (Arria, Caldeira, Bugbee, Vincent, & O’Grady, 2017; Arria et al., 2010). As energy drinks are marketed to teens and young adults, it is possible that advertising results in an increased interest and consumption of illicit drugs, specifically other stimulants (Reissig et al., 2009).

### **2.11.2 Peer pressure**

Peer pressure and the idea of “fitting in” was also identified as a reason to drink energy drinks in focus group studies both in New Zealand and Australia, and was more

prevalent among those in their late teens and early twenties (16 to 21 years old) than older participants (22 to 25 years old) (Bunting et al., 2013; Costa et al., 2014). Research on peer pressure tends to focus on energy drink usage, however in a Serbian study, 23.6% of adolescent coffee drinkers reported they have coffee “due to peer influence”, whereas only 12.6% of energy drink consumers selected this option (Milovanovic et al., 2016). Therefore, an approach that includes a wider range of caffeinated products is needed to determine whether peer pressure influences energy drinks, or caffeine intake in general.

### **2.11.3 Caffeine intake and sensation seeking**

Many studies have found an association between energy drink usage and other risky behaviours such as sensation seeking, alcohol consumption, cigarette smoking and marijuana use (Azagba et al., 2014; Faris et al., 2015; Terry-McElrath et al., 2014). Terry-McElrath et al. (2014) also found an association between soft drink intake and use of cigarettes, alcohol and marijuana; however, they did not analyse the relationship between other caffeinated products such as tea, coffee and chocolate with these associations. A dose-response pattern was found between energy drink consumption and risky behaviours, for example heightened sensation seeking (assessed by agreement with statements such as “I like to try new and exciting things, even if it means breaking the rules” and “I prefer friends who are exciting and unpredictable”) was associated with an odds ratio of 1.28 times for consuming energy drinks more than once per month, compared to an odds ratio of 1.09 for those who consumed energy drinks once or twice a year (Terry-McElrath et al., 2014).

One plausible explanation for the association between energy drinks and risky behaviours is that the subset of adolescents who consume energy drinks frequently are sensation seekers or risk takers in many aspects of their lives. Adolescent boys and young men are both more likely to engage in risk-taking behaviours and consume energy drinks and this relationship may relate to their life period in addition to caffeine consumption (Arria, Bugbee, Caldeira, & Vincent, 2014). More research is needed to understand the motivations for why adolescent boys consume energy drinks, and whether this relationship is due to their caffeine intake or energy drinks specifically. In addition, it is suggested that energy drinks combined with alcohol may increase this effect, so the relationship between caffeine and alcohol also warrants further investigation (Emond et al., 2014; Visram et al., 2016).

## **2.12 Summary of the literature**

Adolescence is a critical period in growth and development; knowledge about caffeine consumption habits and patterns of adolescents will be useful for informing future public health policy, health education to students and advertising/labelling guidelines on the negative effects of caffeine for this age group and ensuring caffeine intake in this group is a primarily positive experience.

As other Western countries, including the UK, move to limit the availability of caffeinated products to children and adolescents, it is a valuable time to investigate the current consumption of and experiences with caffeine amongst New Zealand adolescents. In New Zealand, previous studies have evaluated the amount of caffeine as a nutrient in the diet or the amount of caffeine consumed in sugar sweetened beverages (Thomson et al., 2014; University of Otago and Ministry of Health, 2011). The range and availability of caffeinated products has altered significantly in the intervening ten years since the last Adult Nutrition Survey. Therefore, at present there is no clear evidence on the usage of caffeinated beverages in New Zealand adolescents as there may have been a shift in the culture and consumption of these products since this was last examined.

There are a handful of studies internationally that examine the relationship between caffeine consumption and experiences, however none have been conducted in a New Zealand setting. In New Zealand, previous studies have evaluated the amount of caffeine as a nutrient in the diet or the amount of caffeine consumed in sugar sweetened beverages (Thomson et al., 2014; University of Otago and Ministry of Health, 2011). The products available in New Zealand differ substantially from North America and Europe and therefore it is probable that the experiences with and intakes of caffeine will be unique to New Zealand.

## 3 CHAPTER 3: RESEARCH STUDY MANUSCRIPT

The following chapter is presented as a manuscript prepared for the International Journal of Adolescent Medicine and Health. Abstracts for this journal should not exceed 250 words, and the original article should not exceed 5000 words.

Additional methods are found in Appendix C. Additional results can be found in Appendix D.

### 3.1 Abstract

**Background:** Adolescents are particularly vulnerable to the effects of caffeine due to their lack of tolerance, smaller size, changing brain physiology and increasing independence. Concerns have been raised about adolescent caffeine consumption due to potentially serious physiological and psychological effects following consumption. The motivations that drive caffeine intake are not well understood among adolescents but are important to understand to reduce any harmful behavioural patterns.

**Aim:** This study aimed to explore the caffeine consumption habits (sources, amount and frequency) of New Zealand adolescents; the factors that motivate caffeine consumption and reasons for avoiding caffeine.

**Method:** A previously validated caffeine-consumption questionnaire (CaffCo) was administered on 217 participants (15-18 years) via the online survey software Qualtrics.

**Results:** Most New Zealand adolescents (94.9%) consume at least one caffeinated product daily, the most commonly consumed sources being chocolate, coffee, tea and kola drinks. The median daily caffeine intake was 68 mg·day<sup>-1</sup>. Gender and employment status influenced the source, but not overall amount of caffeine consumed. One fifth (21.2%) of adolescents consumed more than the recommended European Food Safety Authority (EFSA) safe level of 3 mg·day<sup>-1</sup>. Taste, energy and cold temperature were the main motivators for caffeine consumption by adolescents. Increased energy, feeling excited, restlessness and sleep disturbances were frequently reported effects following caffeine consumption.

**Conclusions:** This study provides detailed information on caffeinated product consumption among New Zealand adolescents. A subset of these consume caffeine above the EFSA safe level and may benefit from public health education to reduce

potential caffeine-related harm.

**Key words:** caffeine, adolescents, consumption patterns, New Zealand

## 3.2 Introduction

Globally, at least 70% of people consume caffeine making it the most frequently and widely consumed mental stimulant. Similarly, 71 to 96% of New Zealanders over the age of 15 have been reported to consume caffeine (Thomson et al., 2014). Caffeine intake during adolescence is especially of concern as this is a developmental period during which the brain undergoes changes including development of the prefrontal cortex to prepare for adulthood (Gogtay et al., 2004). Sleep is critically important for this brain development, but high caffeine intake is associated with sleeping problems and daytime sleepiness in adolescents (Kristjansson et al., 2011).

Individual responses to caffeine vary according to genetic and environmental factors, as well as age, gender and habituation to caffeine (Temple, 2009; Yang et al., 2010). Adolescents are still growing, so their smaller size and lack of habituation to caffeine intake increases the risk of experiencing the negative effects of caffeine via intentional excess consumption (Temple, 2019). Generally, at lower caffeine doses, cognitive effects such as improved alertness, reaction time, mood and reduced tiredness typically occur (Seifert et al., 2011; Temple et al., 2017; Temple et al., 2010). At higher doses, there is an increased risk of negative effects of caffeine consumption including anxiety, jitteriness, insomnia and tachycardia (Seifert et al., 2011; Temple et al., 2010; Thomson et al., 2014).

According to Health Canada and the European Food Safety Authority (EFSA panel on dietetic products, 2015; Nawrot et al., 2003) the suggested “safe” levels of caffeine intake are between 2.5-3.0 mg·day<sup>-1</sup>. Worldwide reported daily caffeine consumption varies widely; ranging from 0.52 mg·kg<sup>-1</sup>·day<sup>-1</sup> in South Korea to 2.45 mg·kg<sup>-1</sup>·day<sup>-1</sup> in Europe (Lim et al., 2015; Zucconi et al., 2013).

Understanding how much caffeine adolescents consume and their motivations for intake are important to address safety concerns due to their increased risk of exceeding a safe level of caffeine intake. The reasons that adolescents use caffeine are likely to differ from that of adults or younger children (Bunting et al., 2013; Turton et al., 2016). Sociocultural factors including employment status (disposable income) and cultural norms may also influence the types and amounts of caffeinated products consumed.

Previous studies have determined the amount of caffeine consumed by New Zealand adolescents, with the most recent (Thomson et al., 2014) based on data from the New Zealand Adult Nutrition Survey conducted in 2008/2009. Since that

time, the availability of caffeinated products and caffeine intake patterns are likely to have changed. Therefore, the aim of the present study was to understand current caffeine use among New Zealand adolescents and understand the motivations/ enablers/ barriers for consumption in this age group. The CaffCo questionnaire was chosen as an appropriate tool to quantitatively evaluate caffeine consumption in this age group as opposed to conducting focus groups which would only provide qualitative exploratory data.

### **3.3 Materials and methods**

#### **3.3.1 Participant recruitment**

Secondary school students from the Auckland and Northland regions of New Zealand were invited to complete a web-based questionnaire to investigate their caffeine consumption habits. Participants were recruited via social media, at university open days, shopping malls and via teachers in a classroom setting between June 2016 and July 2017. Those aged 15 to 18 years were eligible to participate. Participants who met this age requirement and completed the questionnaire were included in the study (see Appendix C – additional methods for a diagram of participant recruitment).

Caffeine consumption (or lack of) was not an inclusion/exclusion criterion for participation. Written informed consent was gained before commencement of the study. Ethical approval for this study was granted by the Massey University Human Ethics Committee: Southern A (Application SOA 15/76) (Appendix A).

#### **3.3.2 Caffeine consumption habits (CaffCo) online questionnaire**

The New Zealand validated CaffCo questionnaire (Appendix B) was used to investigate consumption patterns (Rowe, 2015). CaffCo was administered to participants via an online survey software (Qualtrics, 2017) via participants' own devices or on provided tablets (iPads, Apple Inc, Cupertino, California).

CaffCo is comprised of 49 sections which examine the frequency and amount of caffeine consumed from eight sources: tea, coffee, chocolate, energy drinks, kola drinks (note the use of kola to differentiate between the type of soft drink and the brand *Coca-Cola*), caffeinated ready-to-drink alcoholic beverages (RTDs) (e.g. bourbon and kola drinks), sports supplements and caffeine tablets.

The questionnaire collected demographic information including age, gender, ethnicity, self-reported weight (kg) and height (cm), employment status (whether they were a student, unemployed, employed part time or employed full time), highest level of education enrolled in or completed, living situation (alone, with family, in a family situation or other) whether they smoke and current use of oral contraceptives (women only).

Questionnaire items prompt the respondent for their motivations to consume each caffeinated product from a list of 15 to 26 options per product (potential motivations for consumption were determined from focus groups and existing literature during the development of CaffCo) (Rowe, 2015). Following this the reasons for not consuming caffeinated products is explored with a list of nine options per product. Finally, participants are questioned about the effects they may have experienced following caffeine intake, and which products they associate with each effect (see Appendix B for the full list of options of each of the above).

### **3.3.3 Data analysis**

#### **3.3.3.1 BMI**

For participants who self-reported their height and weight (n= 133), BMI was calculated, and respondents were categorised as being underweight (<18.5 kg·m<sup>2</sup>), normal weight (18.5 – 24.9 kg·m<sup>2</sup>), overweight (25.0 – 29.9 kg·m<sup>2</sup>) or obese (>30.0 kg·m<sup>2</sup>) using the WHO BMI cut-offs (World Health Organization, 2000).

#### **3.3.3.2 Daily caffeine intake**

Participants' daily caffeine intake was calculated by combining product caffeine content information (see table 1 in appendix C – additional methods) with the consumption frequency data obtained in the questionnaire.

The consumption frequencies (“never” to “6+ times per day”) were given a numerical factor to quantify daily intake, for example, if a product was consumed once per week, the factor was  $1/7 = 0.143$ . Where a frequency range was given, the middle value of the range was used (e.g. for products consumed 4-5 times per day, the factor would be 4.5). Data for 11 participants who reported consuming no caffeine were removed when calculating median daily caffeine intake.

Total caffeine intake for each source category was calculated by adding each of the products in that category together (e.g. black tea, green tea, iced tea consumption

was combined for the “Tea” category). Likewise, the estimated total caffeine intake was calculated by aggregating the sum of each caffeine source (i.e. sum of total intake for each of the following categories: tea, coffee, chocolate, kola drinks, energy drinks, caffeinated RTDs, sports supplements and caffeine tablets) to give the total daily caffeine intake.

### **3.3.3.3 Key motivators for caffeine consumption by source**

Participants who regularly consumed a caffeine source were given a choice of several possible statements about why they may choose to consume this product. Responses were recorded on a Likert scale (options were “strongly agree”, “agree”, “disagree” or “strongly disagree”). Positive responses to a statement were reported as the sum of participants who responded, “strongly agree” or “agree”.

### **3.3.3.4 Non-consumption of caffeinated products**

Participants were provided with a choice of nine potential barriers that may lead to infrequent or non-consumption of caffeinated products. The potential barriers were “there is too much sugar in it”, “it is too expensive”, “it isn’t good for me”, “it has too much caffeine in it”, “I react badly to it”, “I have never considered taking it”, “I don’t want to be dependent on it”, “I don’t like the flavour” and “I don’t consume caffeine for medical reasons”. The percentage of participants that agreed with each statement for each product was tabulated and presented as a graph for each product.

## **3.3.4 Statistical analysis**

Data was downloaded from the Qualtrics software as Excel files and analysed in IBM SPSS statistical package version 25 (IBM corporation, New York, USA).

Variables were tested for normality using the Kolmogorov-Smirnov and Shapiro Wilk tests and for homogeneity using the Levene’s test. Normally distributed data was expressed as mean  $\pm$  SD and data not normally distributed expressed as median [25<sup>th</sup> - 75<sup>th</sup> percentiles].  $P < 0.05$  was considered statistically significant. Where variables show statistically significant differences, effect size was calculated using the following formula: effect size =  $Z/\sqrt{n}$  (Mann-Whitney U test). An effect size value of 0.10 indicates a small effect, a value of 0.3 indicates a medium effect and a value

of  $\geq 0.5$  indicates a large effect (Cohen, 1992).

## 3.4 Results

### 3.4.1 Participant characteristics

A total of 216 participants with a mean age of 16.6 years  $\pm$  0.82 years (range 15-18 years) completed the questionnaire and their results were analysed. Table 3.1 outlines participant demographic information (gender, employment status and BMI).

**Table 3.1: Participant characteristics by gender**

Participant characteristics	Total n (%)	Boys n (%)	Girls n (%)
<b>Gender*</b>	214 (99.1)	75 (35.0)	139 (65.0)
<b>Employment status (n= 192)</b>			
No paid employment	123 (64.1)	41 (64.1)	77 (63.1)
Paid employment	69 (35.9)	23 (35.9)	45 (36.9)
<b>BMI groups<sup>1</sup> (n= 133)</b>			
Underweight (<18.5 kg.m <sup>-2</sup> )	13 (9.8)	5 (10.0)	8 (9.8)
Normal (18.5-24.9 kg.m <sup>-2</sup> )	98 (73.7)	35 (70.0)	62 (75.6)
Overweight (25.0-29.9 kg.m <sup>-2</sup> )	19 (14.3)	8 (16.0)	11 (13.4)
Obese (30.0 kg.m <sup>-2</sup> )	3 (2.2)	2 (4.0)	1 (1.2)

<sup>1</sup> BMI: Body Mass Index - (World Health Organization, 2000)

\*Two participants reported their gender as "other"

### 3.4.2 Consumption of caffeinated products by source

Table 3.2 shows the number and proportion of participants who consumed caffeine from each source, reported as total number and proportion of participants and by gender and employment status. There were 204 participants who consumed caffeine with a median daily caffeine consumption of 68.3 mg·day<sup>-1</sup> [52.3 - 81.7 mg·day<sup>-1</sup>].

Girls were 2.25 times more likely than boys to consume tea ( $p=0.005$ ), whereas boys were 2.18 times more likely to consume energy drinks ( $p=0.010$ ) than girls. There was a trend for girls to consume more coffee ( $p=0.066$ ) and chocolate ( $p=0.084$ ) than boys.

Participants who were in paid employment were 1.93 times more likely to drink coffee than those not in paid employment ( $p=0.031$ ). Those in paid employment were also 3.23 times more likely to drink caffeinated RTDs than those were not ( $p<0.001$ ).

**Table 3.2: Number and proportion of caffeinated products consumed overall and by gender and employment status**

<b>Caffeine source</b>	All participants n (%)	Boys n (%)	Girls n (%)	Pearson's Chi- square test ( $\chi^2$ )	<i>p</i> - value*	Odds ratio	No employment n (%)	paid employment n (%)	Pearson's chi- square test ( $\chi^2$ )	<i>p</i> -value*	Odds ratio
<b>All sources</b>	215 (94.9)	74 (93.2)	139 (95.7)	-	0.520 <sup>a</sup>	-	123 (96.7)	69 (98.6)	-	0.665 <sup>a</sup>	-
<b>Tea</b>	119 (55.3)	31 (41.9)	86 (61.9)	7.786	0.005 <sup>+</sup>	2.25	73 (59.3)	35 (50.7)	1.336	0.248	-
<b>Coffee</b>	121 (56.3)	35 (47.3)	84 (60.4)	3.379	0.066	-	66 (53.7)	48 (69.6)	4.637	0.031 <sup>+</sup>	1.93
<b>Chocolate</b>	183 (85.1)	59 (79.7)	123 (88.5)	2.980	0.084	-	111 (90.2)	62 (89.9)	0.007	0.931	-
<b>Kola drinks</b>	117 (54.4)	46 (62.2)	70 (50.4)	2.712	0.100	-	73 (59.3)	37 (53.6)	0.592	0.441	-
<b>Energy drinks</b>	68 (31.6)	32 (43.2)	36 (25.9)	6.684	0.010 <sup>+</sup>	2.18	41 (33.3)	23 (33.3)	0.000	1.000	-
<b>Caffeinated RTDs</b>	47 (21.9)	18 (24.3)	28 (20.1)	0.498	0.480	-	19 (15.4)	26 (37.7)	12.178	<0.001 <sup>+</sup>	3.23
<b>Sports supplements</b>	6 (2.8)	3 (4.1)	3 (2.2)	-	0.421 <sup>a</sup>	-	3 (2.4)	3 (4.3)	-	0.669 <sup>a</sup>	-
<b>Caffeine tablets<sup>1</sup></b>	1 (0.5)	-	-	-	-	-	-	-	-	-	-
<b>Consumes no caffeine</b>	11 (5.1)	5 (6.8)	6 (4.3)	-	0.520 <sup>a</sup>	-	4 (3.3)	1 (1.4)	-	1.000 <sup>a</sup>	-

\*Pearson's chi-square test used

<sup>a</sup>Fisher's exact test used (minimum expected count <5)

<sup>+</sup>Significant result ( $P < 0.05$ )

<sup>1</sup> Only one participant reported consuming caffeine tablets, so this source was removed from subsequent analysis

#### **3.4.2.1 Daily caffeine intake**

Table 3.3 shows participants' daily caffeine intake from all caffeine sources, by gender and employment status. Total caffeine intake did not differ between genders ( $p>0.05$ ), including after data was adjusted for body weight ( $p>0.05$ ). However, differences were found between boys and girls when caffeine intake was analysed by source. The median estimated daily intake of caffeine from tea was higher in girls than boys ( $p=0.019$ ). Conversely, the median estimated daily intake of caffeine from kola drinks and energy drinks was significantly higher in boys than girls ( $p=0.003$ ).

The median estimated daily intake of caffeine from coffee and caffeinated RTDs was significantly higher for adolescents who were in paid employment than those who were not employed ( $p=0.021$  and  $p<0.001$ , respectively). Analysis of the type of coffee consumed found a trend towards increased intake of filter/plunger coffee in employed adolescents ( $p=0.065$ ) compared to those who were not employed.

**Table 3.3 Daily caffeine intake based on source by gender and employment status**

Caffeine source	All participants (mg·day <sup>-1</sup> )	Boys (mg·day <sup>-1</sup> )	Girls (mg·day <sup>-1</sup> )	Mann-Whitney test statistic (U)	p-value*	Effect size (r)	No employment (mg·day <sup>-1</sup> )	paid employment (mg·day <sup>-1</sup> )	Mann-Whitney test statistic (U)	p-value*	Effect size (r)
<b>All sources</b>	68.3 [24.9, 158.9]	52.3 [18.3, 109]	67.6 [28.7, 167]	3986.0	0.126	-	68.3 [20.4, 134.3]	67.1 [29.2, 194]	3722.0	0.363	-
<b>Tea</b>	3.71 [0.00, 25.2]	0.00 [0.00, 18.3]	4.33 [0.00, 26.5]	3702.0	0.019*	0.165	4.64 [0.00, 27.0]	0.468 [0.00, 23.2]	3604.5	0.197	-
<b>Coffee</b>	10.7 [0.00, 88.6]	2.04 [0.00, 55.0]	17.4 [0.00, 90.9]	4041.5	0.150	-	5.87 [0.00, 75.4]	31.0 [0.00, 116]	3251.0	0.021*	0.168
<b>Chocolate</b>	6.28 [2.58, 11.4]	5.87 [2.58, 10.0]	6.72 [2.70, 11.3]	4088.5	0.204	-	7.12 [2.70, 11.7]	5.96 [2.70, 11.8]	3828.5	0.541	-
<b>Kola type drinks</b>	2.25 [0.00, 9.25]	5.53 [0.00, 18.2]	1.06 [0.00, 5.56]	3466.5	0.003*	0.209	3.62 [0.00, 8.84]	0.863 [0.00, 11.1]	3698.5	0.312	-
<b>Energy drinks</b>	0.00 [0.00, 3.18]	0.00 [0.00, 19.8]	0.00 [0.00, 1.86]	3601.0	0.003*	0.210	0.00 [0.00, 5.20]	0.00 [0.00, 3.18]	3968.5	0.805	-
<b>Caffeinated RTDs</b>	0.00 [0.00, 0.00]	0.00 [0.00, 0.71]	0.00 [0.00, 0.00]	4282.0	0.289	-	0.00 [0.00, 0.00]	0.00 [0.00, 1.54]	3197.0	0.001*	0.233

Values are medians [25th, 75th percentile]

\*Mann-Whitney test used

+Significant result (P < 0.05)

### **3.4.3 Key motivators for caffeine consumption by source**

Table 3.4 gives the key motivations participants gave for consuming each caffeine source. Taste was the main motivator for consumption of both tea (90.1%) and chocolate (97.3%). Coffee drinkers reported both taste and energy as the primary motivators for consumption (87.7%). While having a cold and refreshing drink was the main motivator for kola drink consumption (94.2%), and energy drinks were consumed for their energizing effects (85.0%). Participants consumed sports supplements for energy (61.2%), because of peer pressure (61.2%) and as a substitute for illegal drugs (61.2%).

**Table 3.4 Percentage agreement of motivation for caffeinated product consumption\***

Motivators	Tea (%)	Coffee (%)	Chocolate (%)	Kola drinks (%)	Energy drinks (%)	Caffeinated RTDs (%)	Sports supplements (%)
Taste	90.1	87.7	97.3	91.0	72.6	74.0	
Temperature (Warm* / cold#)	88.4*	81.2*	71.5*	94.2#	73.9#	60.0#	
To comfort and relax myself	88.4	52.4	64.5			26.0	
Whenever it is offered to me	81.0	73.7	75.8	72.7	64.4	76.0	
Because it is easily available	79.3	77.1	63.4	64.4	49.3		
To wake up	34.7	87.7			72.6		
To stay awake		85.3			82.2		
For energy	26.4	83.6		37.2	85.0		61.2
As a treat			87.7	82.7			
With friends	58.7	75.4	84.4	82.7	63.0	90.0	25.0
For physical energy		67.2			72.6	20	23.1
For the alcohol content						84.0	
Others are eating/drinking it	29.7	46.7	47.3	38	26.0	72.0	38.5
Peer pressure	>10	12.3	>10	>10	12.30	22.0	61.2
As a substitute for illegal drugs							61.2

\*Key motivators expressed as percentage of participants who reported “agree” or “strongly agree” for each statement by source.

A dash “-” indicates that the statement was not a key caffeine motivator for this source.

A grey filled cell indicates that participants were not asked this statement for that source as it was not applicable.

#### **3.4.4 Non-consumption of caffeinated products**

Of the respondents, 58.8% reported never/infrequently drinking tea because of the flavour as did 31.3% of those who reported never/infrequently drinking coffee. While 45.3% of participants reported not consuming coffee due of concerns about becoming dependent on it, only 17.0% gave this as a reason for not consuming tea.

Participants avoided chocolate, kola drinks and energy drinks due to health concerns such as high sugar content (61.4%, 56.6% and 39.0%, respectively).

There were 85.4%, 72.0%, 58.3% and 37.1% of respondents who had never considered taking caffeine tablets, caffeinated sports supplements and gels, caffeinated RTDs and energy drinks, respectively. Many respondents had never considered taking caffeine tablets (85.4% of participants), caffeinated sports supplements and gels (72%), caffeinated RTDs (58%) or energy drinks (37%).

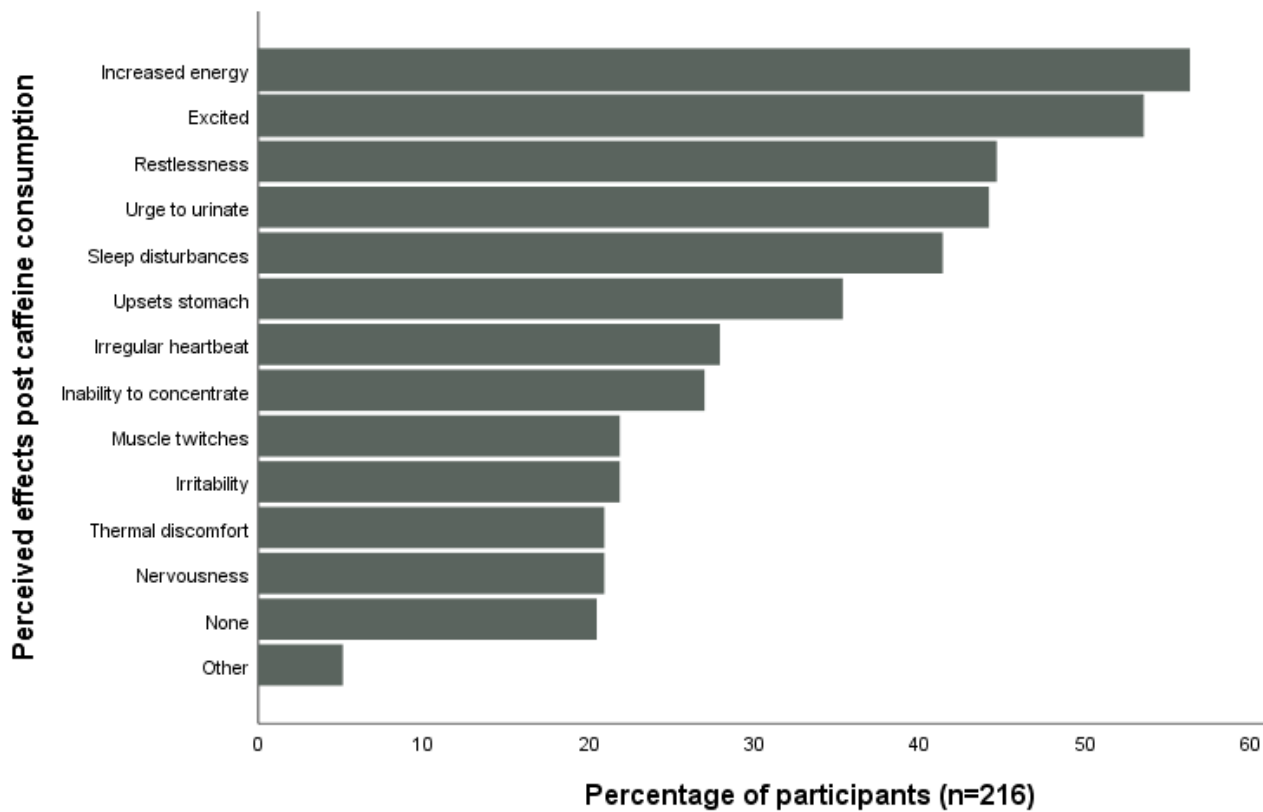
#### **3.4.5 Excess consumption of caffeinated products**

There were 21.1% of participants (22.7% of girls and 17.5% of boys;  $p=0.425$ ), who exceeded the EFSA safe level of  $3 \text{ mg}\cdot\text{kg}^{-1}\cdot\text{day}^{-1}$  (EFSA panel on dietetic products, 2015).

Coffee drinkers were 7.86 times more likely to consume caffeine in excess of the safe level than non-coffee drinkers ( $p<0.001$ ). Tea drinkers were 5.89 times more likely to consume over the safe level than non-tea drinkers ( $p<0.001$ ). Similarly, energy drink consumers were 2.44 times more likely to consume over the safe caffeine level than non-energy drink consumers ( $p=0.021$ ). A trend also exists between consumption of caffeinated RTDs and exceeding the safe level of caffeine intake ( $p=0.054$ ).

#### **3.4.6 Perceived effects from caffeine consumption**

Most participants (79.5%) reported experiencing at least one type of perceived effect following caffeine consumption. The most frequently reported perceived effects were “increased energy” (56.3%), “excited” (53.5%), “restlessness” (44.7%), “urge to urinate” (44.2%) and “sleep disturbances” (41.4%) (Figure 3.1).



**Figure 3.1 Self-reported "perceived effects" experienced post caffeine consumption**

Participants who reported perceived effects had a significantly higher intake of coffee ( $p < 0.001$ ) and energy drinks ( $p = 0.004$ ) than those who reported no perceived effects. In contrast, those who reported no effects had a higher level of chocolate consumption than those who reported at least one effect ( $p < 0.001$ ).

## **3.5 Discussion**

This study found most (94.9%) New Zealand adolescents 15 to 18 years regularly consumed at least one caffeinated product per day. Chocolate, coffee, kola drinks and tea were frequently consumed sources, with taste and an anticipated energy boost reported as the main motivations for caffeine use. A fifth (21.1%) of adolescents exceed EFSA guidelines and were at risk of experiencing adverse effects following caffeine intake. Perceived effects of caffeine consumption included increased energy, feeling excited, restless and difficulty sleeping.

### **3.5.1 Prevalence of consumption of caffeine**

Our findings indicate the proportion of New Zealand adolescents consuming caffeine on a daily basis has risen from 71% as reported by Thomson et al. (2014) in 2008/2009 to 94.9% as observed in the present study. Daily caffeine consumption among adolescents is similar to reports from the USA where 71% to 96% of adolescents are reported to be regular caffeine users (Ahluwalia & Herrick, 2015; Temple et al., 2010).

Chocolate, coffee, kola drinks and tea had the highest prevalence of caffeine consumption (85.1%, 56.3%, 55.4% and 55.3% respectively). Although chocolate was consumed by the majority of participants, this was not a significant contributor to caffeine intake due to its low caffeine content and infrequent intake. Coffee was the most significant contributor to daily caffeine intake; consistent with the most recent survey of New Zealand adolescent caffeine intake (Thomson et al., 2014). This study found coffee contributed 75% of caffeine intake, followed by soft drinks and tea, however this study did not examine energy drink intake (Thomson et al., 2014). In contrast, studies among Canadian, USA and Croatian adolescents found soft drinks including kola drinks were the most frequently consumed caffeinated beverages (Temple et al., 2010; Turton et al., 2016; Valek et al., 2004). It is not clear why these differences exist; accessibility to these products may play a role as soft drinks are frequently available for sale in schools in the USA and Canada and accessibility is known to influence intake (Turton et al., 2016). Alternatively, these patterns may reflect cultural norms. New Zealand has a prominent “café culture” and adolescents are influenced by the products their parents consume, which may explain why coffee intake appears to be greater than elsewhere.

### **3.5.2 Daily caffeine intake**

The present study found a median daily caffeine intake of 68.3 mg·day<sup>-1</sup> among secondary school students. This is similar to caffeine intakes reported for Australians aged 14 to 16 years (41.7 mg·day<sup>-1</sup>) and Americans 13 to 17 years (52 to 66 mg·day<sup>-1</sup>) (Beckford et al., 2015; Tran et al., 2016). New Zealand adolescent caffeine intake falls towards the lower end of the global spectrum which varies substantially. In South Korea, the mean caffeine intake for adolescents aged 15 to 18 was 30.04 mg·day<sup>-1</sup> (Lim et al., 2015). In contrast, a study of 32,000 European adolescents aged 10 to 18 had a higher mean daily caffeine intake of 149.20 mg·day<sup>-1</sup> (Zucconi et al., 2013). These variations are unlikely to be due to the sample size or method of data collection as the studies from the USA, South Korea and Europe were all large, nationally representative studies, and differences may relate more to the cultural norms around caffeinated products that exist in these countries/regions (for example, Zucconi recruited participants primarily from Italy, which is known for its coffee consumption, whereas coffee is more uncommon in South Korea). The differences between New Zealand and Australia, which have similar cultures and caffeine regulations may be due to the slightly older age group of the present study (14 to 16 years versus 15 to 18 years), as older adolescents generally consume more caffeine than younger adolescents (Tran et al., 2016).

#### **3.5.2.1 Energy drink consumption**

The rising levels of energy drink consumption among adolescents is concerning due to both their high sugar and caffeine content. The present study found energy drinks were consumed by 31.6% of adolescents, substantially higher than the previously reported value of 3.1% of New Zealand adolescents from data collected in 2008/2009 (Thomson et al., 2014). The corresponding rapid rise of adolescents exceeding safe consumption levels reflects worldwide concern about increasing caffeine intake, and is likely a result of the increased availability of energy drinks in the New Zealand market in the intervening decade. Since total caffeine intake has been relatively stable over the past 10 years, this suggests that adolescents may be replacing tea, coffee and more traditional sources of caffeine with energy drinks. Energy drink intake has been associated with risky or negative health behaviours including sensation seeking, poor sleep patterns and intake of cigarettes, alcohol and illicit drugs in several studies (Azagba et al., 2014; Faris et al., 2015; Terry-McElrath et al., 2014). These behaviours frequently begin during adolescence, and more information is needed to determine if

the relationship between energy drink usage and negative health behaviours exists in New Zealand, as these adolescents in particular may benefit from harm-reduction education.

### **3.5.2.2 Caffeine intake and gender differences**

In this study, no difference in overall caffeine intake was observed between boys and girls (even after adjusting for body weight,  $p>0.05$ ) which is consistent with several studies (Ahluwalia & Herrick, 2015; Milovanovic et al., 2016; Valek et al., 2004). This a point of contention in the literature, however, as several other studies found that boys had a greater caffeine intake than girls (Beckford et al., 2015; Penolazzi, Natale, Leone, & Russo, 2012; Pollak & Bright, 2003; Temple et al., 2010).

We found that boys had a greater caffeine intake from energy drinks and kola drinks than girls which is consistent with many previous studies (Azagba et al., 2014; Ludden & Wolfson, 2010; Nowak & Jasionowski, 2015; Temple et al., 2010; Terry-McElrath et al., 2014). Boys were 2.18 times more likely to drink energy drinks than girls, which may relate to the way these products are promoted, as studies have found that energy drinks are viewed more as a “drink for males” and advertising is aimed at young men. Therefore, efforts to reduce negative effects of caffeine should focus on advertising and labelling regulations to target boys (Bunting et al., 2013; Reissig et al., 2009).

We observed no differences between the proportion of boys and girls who consumed kola drinks ( $p=0.100$ ), however, boys had a higher intake of caffeine from kola drinks ( $5.53 \text{ mg}\cdot\text{day}^{-1}$  compared to  $1.06 \text{ mg}\cdot\text{day}^{-1}$ ). This suggests that boys who drink kola drinks consume large volumes and accordingly excessive amounts of sugar, although the reasoning for this was not examined. This may be useful to those investigating sugar sweetened beverage intake, although these products contain a relatively small caffeine content so are unlikely to result in serious side effects due to the caffeine.

Girls had a greater intake of caffeine from tea than boys. The higher consumption of tea by girls (2.25 times) than boys has been previously reported and could relate to the idea that tea is perceived as a more “feminine” drink as is the case in North America (Ludden & Wolfson, 2010; Temple et al., 2010). As products consumed by boys and girls differ, different strategies are needed to target high consumers. Energy drinks and kola drinks are subject to labelling regulations under the 2010 Food Standards code, so these may need to be changed to provide more information to consumers on the package (Ali et al., 2018). Whereas tea, more commonly consumed

by girls, is not subject to the same legislation, therefore a different strategy is needed to improve adolescents “caffeine literacy” and highlight the effects of excess caffeine intake (Ali et al., 2018).

### **3.5.2.3 Employment status**

The current study found no difference in the total caffeine intake between those who are employed compared to those who are not. This outcome is contrary to a previous study that found secondary school students who had a job had a greater caffeine intake than those who did not (Emond et al., 2014). However, employed adolescents were 1.93 times more likely to drink coffee and 3.23 times more likely to drink caffeinated RTDs than those who were not employed. To the best of our knowledge, this result has not previously been described. There was a trend towards increased filter/plunger coffee intake in employed adolescents. This may be because coffee is available at their job, or because they feel they need more coffee to give them energy to both work and attend school. A Canadian qualitative study among adolescents in grades 9 to 12 reported that accessibility of a food or beverage was a primary reason for consumption of that food/beverage, as participants spoke about choosing beverages that were available within a short distance of their school, home or workplace (Turton et al., 2016). Additionally, adolescents who are employed either part or full time will likely have greater disposable income than their non-employed counterparts which they can spend on caffeine containing products if they choose. Therefore, employed adolescents may have increased accessibility to coffee and caffeinated RTDs that are perceived as more expensive caffeinated products and can spend more money on caffeine sources that are perceived as expensive (Faris et al., 2015).

Caffeinated RTDs are also perceived as expensive and are less accessible to New Zealand adolescents as they are only legal for purchase by those 18 years and over. However as caffeinated alcoholic beverages are more accessible to older adolescents, it follows that they are more likely to consume them. This was confirmed by a previous study in Israel where the use of caffeinated alcoholic beverages was found to be higher among older adolescents and males (Magnezi, Bergman, Grinvald-Fogel, & Cohen, 2015). We were unable to undertake age-based analysis of caffeinated products due to limited sample size. A different approach may be needed to better understand this relationship.

### **3.5.3 Estimated daily caffeine consumption and caffeine related risk**

The present study found a median intake of  $68.3 \text{ mg}\cdot\text{day}^{-1}$  among New Zealand adolescents which corresponds to  $1.21 \text{ mg}\cdot\text{kg}^{-1}\cdot\text{day}^{-1}$ . This average estimate is well below the adverse effect ( $3 \text{ mg}\cdot\text{kg}^{-1}\cdot\text{day}^{-1}$ ) suggested by European Food and Safety Authority (2015). However, one fifth (21.1%) of participants exceeded this amount daily; a higher proportion than the 7% reported by Thomson et al. (2014) in New Zealand adolescents consuming above the safe level. Some of this increase is likely due to the inclusion of a wider range of caffeinated products or the emergence of products with a greater caffeine content. However, it may also represent an increasing group of high caffeine consumers. The proportion of New Zealand adolescents (21.1%) exceeding the safe level of caffeine intake was also significantly higher than several previous studies in Croatia and USA which found 6.5% (Valek et al., 2004) and 10% (Ahluwalia & Herrick, 2015) of the adolescent population respectively exceeding the lower Health Canada safe level of  $2.5 \text{ mg}\cdot\text{kg}^{-1}\cdot\text{day}^{-1}$  (Nawrot et al., 2003). Those who exceed the daily safe level of caffeine intake would benefit most from education about the benefits and risks of caffeine use. This group may be difficult to target as they are not easily identifiable by gender, employment status or BMI, but rather the products they chose to consume (tea, coffee and energy drinks).

### **3.5.4 Motivations for caffeine consumption**

Taste was identified as a significant motivator promoting consumption of all caffeinated products barring sports supplements and gels. For tea consumption, taste was more important than other qualities including increased energy/reduced tiredness. This is consistent with previous findings from a Canadian focus group study of adolescents in grades 9-12 which found that taste and energy provision were the most frequently reported reasons for consuming specific caffeinated products (Turton et al., 2016). In this study tea was consumed primarily for the attributes of taste and temperature as well as to relax, suggesting tea drinkers view their drinking as habitual rather than relying on the caffeine content. This is consistent with a Serbian study where adolescents identified their main reason for drinking tea was "as a habit" (Milovanovic et al., 2016).

It is interesting to note that many participants who did not consume coffee based on concern about becoming dependant on caffeine (reported by 45.3% of non-consumers), however participants were less concerned about becoming dependent on

tea (17.0% of non-consumers gave this as a reason to avoid tea) despite both products providing a significant amount of caffeine (The New Zealand Institute for Plant and Food Research Limited & Ministry of Health, 2015).

The cognitive effects of caffeine were desired by coffee drinkers and energy drink users. They identified the energising effects (e.g. “to stay awake”, “for energy” and “to wake up”) as the main reason to consume these beverages. This was consistent with previous findings that adolescents ingest coffee “to stay awake” and energy drinks to “boost energy” (Milovanovic et al., 2016). Canadian adolescents also showed a good level of awareness of the caffeine levels in these products, and that adolescents may drink coffee or energy drinks for their energy boosting, even if they dislike the taste (Turton et al., 2016).

Unlike previous studies, peer pressure was not explicitly identified by participants as a major reason to consume caffeinated products except for sports supplements (Reissig et al., 2009). However, as Bunting et al. (2013) noted, those in their later teens and early twenties (16 to 21 years old) are more image conscious and may use energy drinks as a way of “fitting in” compared to older individuals (22 to 35 years old). Peer pressure may be a subconscious influence on adolescent caffeine consumption as participants identifying eating or drinking these products “with friends”, or “whenever offered” as major motivators for having tea, coffee, chocolate, kola drinks and caffeinated RTDs.

Previous studies have identified the effect of advertising as a significant trigger for caffeine consumption, and specifically energy drink intake in adolescents (Costa et al., 2014; Reissig et al., 2009). However, this was not identified as a major reason for caffeine consumption in the present study. It is possible that the effect of advertising occurs on a subconscious level as this age group have a high level of exposure to energy drink advertising (Hammond & Reid, 2017). The methods used in the present study may not be sensitive enough to elucidate the relationship between caffeine and advertisements in New Zealand; a more precise tool could be developed to clarify this issue.

Sports supplement and gel usage among participants in this study was low, with only 2.8% of participants reporting that they use these regularly. These products are generally used by athletes to improve performance as an ergogenic aid (Braun et al., 2009). However, when asked about their key motivations for consuming these products, participants reported “peer pressure” and “as a substitute for illicit drugs” in

addition to the expected response of “for energy”. This is potentially problematic behaviour and should be investigated further as it appears similar to reports of sensation seeking that has previously been related to energy drink consumption (Arria et al., 2010).

### **3.5.5 Perceived effects of caffeine consumption**

The majority (79.5%) of participants reported experiencing at least one type of perceived effect following caffeine consumption. The most frequently reported perceived effects were increased energy, excited, restlessness, urge to urinate and sleep disturbances. Previous reports have suggested that adolescents consuming caffeinated products expect to experience increased energy (Bunting et al., 2013; Faris et al., 2015), altered mood (Van Batenburg-Eddes et al., 2014), and to combat sleepiness (James et al., 2011; Pollak & Bright, 2003).

Adolescents who reported perceived effects had higher intake of coffee and energy drinks. Since these participants reported consuming them for their energizing benefits, they are aware of the caffeine content of these products and expect to experience these effects following consumption. Previous studies have shown adolescents have a good understanding of the links between energy and coffee and a good knowledge of the effects of caffeine including short-term increase in energy, rapid heart rate, jitteriness and insomnia (Faris et al., 2015; Turton et al., 2016). This suggests that negative effects of caffeine were not a deterrent to caffeine intake and were unlikely to impact consumption.

### **3.5.6 Uses of the research**

The current research helps to show that there are some adolescents who may benefit from public health education about the effects of caffeine, including those who exceeded the daily safe level. At present, the data does not identify any specific groups (e.g. by gender, employment status or BMI) who would benefit from this approach. This study adds to the body of research about adolescent caffeine intake patterns, and the motivations for caffeine use may be helpful for informing public health strategies (education, labelling, advertising regulations) to support healthy caffeine habits among adolescents by increasing their “caffeine literacy” (Ali et al., 2018).

Use of a convenience sample and relatively small sample size were limitations that may have affected the accuracy of the caffeine consumption data and reduce the generalisability of results. It is possible that the present study may overestimate proportion of adolescent caffeine consumers as the study was recruited as a caffeine consumption study, which caffeine non-consumers may have felt was not applicable to them. The strengths of this study were using of CaffCo, a New Zealand validated questionnaire; confirming that similar patterns of caffeine intake exist in New Zealand as overseas and increasing the understanding of how the motivations for caffeinated product consumption vary by source.

In future, a larger, more diverse sample such as from the implementation of CaffCo as a nationwide study would allow for cluster analysis to occur to better identify caffeine user types and to see how these patterns change over the life course. Sports supplement and caffeinated RTD users are two groups of adolescents where more research is required, as these show concerning intake patterns and motivations for use and a more in-depth approach is required.

### **3.6 Conclusion**

Most New Zealand adolescents regularly consume caffeine, but the majority have a moderate intake. Coffee is the main contributor to daily caffeine intake followed by chocolate and tea. Both gender and employment status affect the source, but not the overall level of caffeine intake. Taste, energy and cold temperature were the main reasons adolescents chose to consume caffeinated products, with a small number of adolescents using sports supplements due to peer pressure or instead of illicit drugs. A fifth (21.1%) of adolescents had a daily caffeine intake above the recognised safe level and these individuals had a higher intake of coffee, tea and energy drinks than those who did not exceed the safe intake level. Adolescents who consume greater than the safe level of caffeine would benefit from strategies designed to improve caffeine literacy in order to reduce risk of caffeine-related harm.

## 4 CHAPTER 4: CONCLUSIONS AND RECOMMENDATIONS

### 4.1 Summary of findings/main results

The aim of the present research was to use an online questionnaire to understand the motivations of New Zealand secondary school students who consume caffeine, how much they consume and from which sources.

Using the CaffCo questionnaire we found that most (94.9%) adolescents regularly consume moderate quantities of caffeinated products. The median intake from all sources was  $68.3 \text{ mg}\cdot\text{day}^{-1}$ , lower than the previous estimate of  $82 \text{ mg}\cdot\text{day}^{-1}$  (Thomson et al., 2014) among New Zealanders aged 13 to 19 and similar to adolescent caffeine intakes in the USA and Australia (Beckford et al., 2015; Tran et al., 2016).

Gender and employment status had no effect on the quantity of caffeine ingested, however these factors affected the caffeinated products consumed. Boys were more likely to consume energy drinks and kola drinks than girls, whereas girls consumed more tea than boys. Employed secondary school students consumed more coffee and caffeinated RTDs than those not employed, which may reflect easier accessibility of these products by employed adolescents. There was no relationship between BMI and caffeine intake (either total or by source).

Although there has been a modest reduction in the total intake of caffeine among adolescents since previous New Zealand surveys, there has been an increase in the proportion of high consumers. One fifth (21.1%) of New Zealand adolescents had a daily caffeine intake above recognised safe levels (EFSA suggested level of  $3 \text{ mg}\cdot\text{kg}^{-1}$ ), compared to 7% in 2008/2009 (Thomson et al., 2014). Adolescents were at high risk of exceeding the safe intake level if they consumed coffee, tea or energy drinks.

Motivations for caffeinated product consumption varied, but for most sources the reasons were related to the attributes of the beverage (taste or temperature) or its energising effects. Drinking with friends and the alcohol content were the main motivating factors for caffeinated RTD consumption, which may imply a level of peer pressure, although that was not explicitly identified by participants as a key motivation. A small group of participants who use sports supplements and gels identified “peer pressure” and “as an alternative to illicit drugs” as motivations for consumption; to the best of our knowledge this is a novel finding. Contrary to previous literature, adolescents did not feel peer pressure or advertising were drivers of caffeine intake

(Bunting et al., 2013; Reissig et al., 2009).

Several themes emerged for the non-consumption of caffeinated products, these being taste; health concerns; and concern about dependence on a product.

An additional aim was to understand the effects adolescents feel following caffeine consumption. Adolescents who consumed coffee and energy drinks were more likely to report that they perceived effects following consumption, which may be related to expectation, as energising effects was the main motivator for consumption of coffee and energy drinks. Increased energy, feeling excited, restless and sleep disturbances were the most frequently reported effects.

## **4.2 Strengths**

It is our understanding that this study is the most comprehensive exploration of caffeine consumption among New Zealand adolescents to date. Previous studies in New Zealand have focused on some, but not all caffeinated products giving an incomplete picture of caffeine intake, as effects of caffeine are summative. A limited number of international studies focused on total caffeine intake (with the majority examining energy drink use), although these did not examine why these products were consumed (Ahluwalia & Herrick, 2015; Pollak & Bright, 2003; Temple et al., 2010). Therefore, examining caffeine intake by source and aligning this to the motivations for consuming individual sources appears to be unique in the international literature.

The current study also looked at the motivations for consumption and the non-consumption of each individual caffeinated product. This is important because caffeinated products are consumed for a variety of reasons including in a social context, for the flavour and other attributes of the product, not solely for their caffeine content. A further strength of this research was the novel approach to understanding caffeine consumption among adolescents. This will lead to better understanding of why specific caffeine sources are consumed and therefore inform on the most appropriate mechanisms to reduce risky behaviours.

CaffCo was developed using focus groups to capture the breadth of potential motivations for caffeine use. The questionnaire was tested in New Zealand, so products listed were familiar to most participants, which allowed them to record all products consumed as accurately as possible. Therefore, a strength of this data is that it is more accurate than previous measures which gathered information on the frequency of consumption of product categories.

### 4.3 Limitations

One significant limitation of this study was the reliance on retrospective self-reported data for the food frequency questionnaire portions of the study. Participants were required to select how frequently they consumed eight categories of caffeinated products, which may have led to some questionnaire fatigue and inaccuracy in reporting consumption frequency. The cross-sectional design also means that this may not reflect year-round caffeine intake, as caffeine intake may increase during times of stress such as during an exam period (Richards & Smith, 2015).

Questionnaire fatigue was one possible reason that a significant number of participants did not complete the questionnaire (180 questionnaires were incomplete out of 397 recruited). The questionnaire was advertised as taking approximately 15 minutes to complete; however, this was dependent on the number of caffeinated products consumed. The CaffCo questionnaire is designed to be compared across age groups as part of a wider study, but could have undergone revision to only include the questions that were applicable to this study. This would have reduced the length of time taken to complete the questionnaire and may have led to a lower dropout rate.

A third limitation was that a statistical power calculation was not conducted to determine sample size. Similar studies of caffeine consumption patterns in this age group have found significant results with sample sizes between 52 and 571 participants (Temple et al., 2010; Valek et al., 2004). Calculating sample size for this study would have ensured enough power to conduct analysis into more participant characteristics (e.g. BMI, smoking status) and improved our understanding of infrequently consumed caffeinated products (sports supplements/gels and caffeine tablets).

Use of a relatively small, convenience sample of participants reduced the generalisability of the results of this study. Weight and ethnicity of study participants differed to the general population. The average BMI of participants was 21.3 kg.m<sup>-2</sup>, with 16.6% of participants overweight or obese, whereas the most recent health survey found 17.4% of adolescents aged 15 to 17 were obese (Ministry of Health, 2018). Several ethnic groups were underrepresented; (9.9% of the study sample identified as Māori vs 15% of New Zealanders over 15; Pacifica Peoples made up 5.2% of the study sample vs 7% of New Zealanders over 15), whereas other groups were over represented (19.8% of participants were Asian vs 12% of New Zealanders over 15) (Statistics New Zealand, 2014). To make this more applicable to the general

population, greater participant numbers are needed, with care taken to match the demographics of New Zealand. At the time of conducting the present study, ethics approval did not allow for the analysis of caffeine consumption patterns by ethnicity, but this may explain some of the differences in caffeine intake and the reasons for this intake.

Participants were not pre-screened to determine if they had any health conditions or medications that would affect their caffeine intake. Those with existing conditions including cardiac disease, hypertension, psychiatric disorders or renal dysfunction are frequently advised by their doctors to limit or reduce their caffeine intake which may confound data about their consumption habits and associated symptoms (Temple et al., 2017). Medications consumed by participants may also influence caffeine patterns and reported symptoms. A New Zealand-based pharmacist run website [www.drugs.com](http://www.drugs.com) lists 98 drugs known caffeine-drug interactions, including 14 major interactions for medications to treat conditions including ADHD, allergies and depression (Carrillo & Benitez, 2000; Drugs.com, 2019). In future, a brief health screening survey should be added at the start of the questionnaire to ensure participants are recruited from a healthy population.

Many participants completed the questionnaires in a school or university environment, where students may have felt uncomfortable divulging behaviours such as smoking or underage alcohol use, despite understanding the questionnaire was anonymous. This may be improved by encouraging students to answer the questionnaire in an environment where their privacy is ensured.

#### **4.4 Use of findings**

Prior to the current study, a gap existed in the literature regarding caffeine intake patterns and motivations for caffeine consumption among New Zealand adolescents. The most recent data collected in this age group was a decade old, and trends change rapidly among adolescents (Thomson et al., 2014). Caffeine consumption can have serious adverse outcomes, and therefore it is important to identify any groups that may be at increased risk of experiencing negative outcomes. These risks (and the benefits of caffeine consumption) are dose dependent so an in-depth survey into the quantity and sources of caffeine consumed by adolescents gives us more detailed information about potential groups who could be targeted with risk reduction strategies. Understanding what motivates the intake of individual caffeinated products may be

useful to provide tailored advice about potential risks.

As reported in Chapter 3 (the manuscript), 21.1% of adolescents consume above the EFSA safe level of caffeine, meaning that the risk of excessive caffeine intake is a potential problem that is widespread across New Zealand. General education about the risks and benefits of caffeine consumption will be useful and could be included in the secondary school health curriculum. Food and nutrition are one of seven key areas of learning in the Health and Physical Education curriculum which are taught in both primary and secondary schools (Ministry of Education, 2014). A classroom setting would be an optimal place for students to increase their “caffeine literacy”, as previous studies have shown adolescents have a limited understanding of which products contained caffeine (Ludden & Wolfson, 2010). Educating adolescents about the risks and benefits of caffeine consumption and develop understanding of caffeinated products due to their near ubiquitous intake. Resources and games could be developed in conjunction with health professionals. These would focus on explaining the wide range of products that contain caffeine; symptoms to watch out for and where to seek help if individuals are worried that they had consumed too much.

Regulatory agencies such as Food Standards Australia New Zealand could use the data from this study as it demonstrates a rapid increase in the proportion of adolescents consuming over the adverse safe level for caffeine consumption in the past 5 years. Energy drink advertisements target teenage boys, and there is an associated increase intake of energy drinks consumption by boys compared to girls of the same age (Reissig et al., 2009). The effect of advertising is likely to occur on a subconscious level as adolescents did not identify advertising as a key motivation for energy drinks consumption. Strategies should be put in place to limit advertising of energy drinks to this group or provide more explicit labelling about safe levels of caffeine consumption and the possible effects of excessive intake. Energy drink intake was associated with an increased likelihood of exceeding the safe intake level of caffeine, thereby raising the risk of caffeine-related harm (e.g. caffeine intoxication), so current advertising legislation and labelling requirements are ineffective. Banning or limiting advertising of energy drinks, providing explicit labelling on highly caffeinated products with regards the effects of caffeine, or a total ban on the sale of energy drinks to those under the age of 18 would be justifiable to reduce the risk of caffeine-related harm in adolescents who often not only exceed the safe level of intake but are also more vulnerable to the effects of caffeine.

## 4.5 Future directions/recommendations

- Conducting the CaffCo questionnaire across all age groups and communities in New Zealand will increase sample size and better reflect the demographics of New Zealand, reducing the limitations from a convenience sample. With a larger sample, a cluster analysis could be performed to determine whether there are any subgroups that describe “caffeine user types” (Wilks, 2011). Identification of caffeine user types would match the motivations for caffeine consumption and symptoms experienced following intake (for example – this may identify a group of heavy coffee drinkers that report using coffee “for energy” and “to get through the day”, and who experience few if any side effects). The results from this study indicate that employed adolescents were more likely to drink coffee and caffeinated RTDs which may be related to their increased disposable income and accessibility to these products. To determine if these relationships exist, a larger sample size and more specific questions e.g. “do you consume these products because you can afford them now?” need to be incorporated into the questionnaire. Classifying users into “caffeine user types” would allow us to better understand the behaviours of these groups and provide a basis for educating the public about caffeine if any particular group showed a pattern of concerning behaviour.
- Incorporating a question into the New Zealand Health Survey would give a demographically representative view of how caffeine intake patterns change over time. The annual New Zealand Health Survey currently tracks the consumption of some but not all caffeinated products (data is currently collected on soft drink and energy drink use). It would be relatively simple to change the wording of that section to include “products of concern” such as caffeinated products. As this survey is administered to New Zealand adults randomly based on the electoral roll, this would overcome the issues associated with a convenience sample and would also better reflect the ethnic and socioeconomic make-up of New Zealand. Since this is an annual survey with a large sample size, it would allow for a very accurate observation of how caffeine intake varies over time and whether any implemented strategies to prevent excessive caffeine intake are effective.
- The cross-sectional design of the questionnaire captures only a snapshot of caffeine consumption and does not give any information about how intake or

motivations change during different times of the year or as adolescents age. One solution would be to repeat the questionnaire on the same participants three to four times a year to capture seasonal variations. In addition, following the cohort for a period of four years starting at age 15 would also allow us to see whether the amount of caffeine or the caffeinated products, and the motivations for using these products evolve during secondary school. To our knowledge there are no longitudinal studies on adolescent caffeine, so repeated surveying of the same individuals would be a novel approach. This would allow targeted, age appropriate education on safe use of caffeine if future research determines there is a problem.

- An investigation into the differences between rural and urban caffeine use in adolescents and adults would also be an interesting application of the CaffCo questionnaire. All adolescents in the present study (and in previous data collections using CaffCo) lived in cities (Auckland, Palmerston North or Whangarei). The differences in lifestyle, occupations and accessibility of caffeine sources may have an impact on what is consumed and why. Key questions would include the motivations for consumption and why products were not consumed. A temporal element could be included as well to understand what time of day these products are used and how this relates to intake e.g. does the rural population start caffeine intake earlier and how does this affect total caffeine intake?
- Further research into caffeine consumption by adolescents is needed, particularly among sports supplement and caffeinated RTD users. Sport supplement users were motivated to use supplements as an alternative to illicit drugs, and a focus of further investigations should explore this in depth to gain better understanding of the context for this use. Future investigations of sport supplement use should focus on young athletes as this group are more likely to consume sports supplements and gels.

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## 6 APPENDICES

### Appendix A: Massey University Human Ethics Committee approval letter and update



Date: 03 April 2017

Dear Dr Aj Ali

Re: Ethics Notification - **SOA 17/01 - Caffeine consumption and the impact of genetic variants on caffeine-related responses in New Zealanders**

Thank you for the above application that was considered by the Massey University Human Ethics

Committee: **Human Ethics Southern A Committee** at their meeting held on **Monday, 3 April, 2017**.

On behalf of the Committee I am pleased to advise you that the ethics of your application are approved.

Approval is for three years. If this project has not been completed within three years from the date of this letter, reapproval must be requested.

If the nature, content, location, procedures or personnel of your approved application change, please advise the Secretary of the Committee.

Yours sincerely



Dr Brian Finch  
Chair, Human Ethics Chairs' Committee and Director (Research Ethics)

**Research Ethics Office, Research and Enterprise**

Massey University, Private Bag 11 222, Palmerston North, 4442, New Zealand T 06 951 6841; 06 95106840

**E** [humanethics@massey.ac.nz](mailto:humanethics@massey.ac.nz); [animalethics@massey.ac.nz](mailto:animalethics@massey.ac.nz); [gtc@massey.ac.nz](mailto:gtc@massey.ac.nz)

**From:** [Broad, Patsy](#)  
**To:** [Ali, Ajmol](#)  
**Subject:** Southern A Applications SOA 17/01  
**Date:** Friday, 11 May 2018 4:17:00 PM  
**Attachments:** [image001.png](#)

---

**HEC: Southern A Application SOA 17/01**

Title: Genetic Associations with Caffeine Consumption and Experiences in NZ Adults -  
Rebecca Tennent

Title: Secondary School Students and Caffeine: Consumption Habits and Experiences -  
Sophie Turner

Dear Aj

Thank you for your email dated 10 April 2018 outlining the change you wish to make to the above application.

The change to the consent form has been approved and noted to allow for the option of participants to approve of their contact details being maintained for contact regarding future studies.

If the nature, content, location, procedures or personnel of your approved application change, please advise the Secretary of the Committee. If over time, more than one request to change the application is received, the Chair may request a new application.

Regards

Patsy

*Patsy Broad*  
*Team Leader, Research Ethics*  
*Research Ethics Office*  
*Courtyard Complex, Room 1.23*  
*Manawatu Campus*  
*Massey University/Te Kunenga ki Purehuroa*  
*Private Bag 11222*  
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*Extension: 83840*

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*[net/](http://rims.massey.ac.nz/rme)*

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## **Appendix B: Copy of CaffCo questionnaire for secondary school students**

### **CaffCo for Athletes - Under 18**

#### **Start of Block: 1- Introduction**

##### Caffeine Consumption Habits Questionnaire

Thank you for taking the time to complete this questionnaire. This questionnaire examines the influences on consumption of various caffeine-containing beverages and foods found in New Zealand.

The questionnaire has been designed to be completed by people aged 15 years and over. Data collected from this questionnaire is confidential.

Further information can be found in the information sheet below; please read this before continuing with the questionnaire. The questionnaire will take 10-20 minutes to complete.

What is your age?

---

Click to write the question text

I have read and understand the information sheet provided and agree to participate in the study under the terms laid out in the information sheet.

Yes

No

End of Block: 1- Introduction

Start of Block: 3 - ID number block



Please enter your participant ID number (please enter your email address if you have not been given a participant ID).

---

---

Have you provided a saliva sample on location?

- Yes
- No

End of Block: 3 - ID number block

---

Start of Block: 4- Screening questions



Which of these items do you drink / eat? Include those that you only consume occasionally.

- Tea (black / green)
- Coffee
- Chocolate
- Kola flavoured drinks (e.g. Coca-Cola, Pepsi etc)
- Energy drinks / energy shots
- Premixed caffeinated alcoholic RTDs with a kola drink base (e.g. rum and kola) or with added caffeine / guarana
- Caffeinated pre-workout sports supplements and sports gels
- Caffeine Tablets (e.g. No Doz)
- ☒ None one of the above



What is your gender?

- Male
- Female
- Other

End of Block: 4- Screening questions

---

Start of Block: 5 -Tea



How often do you drink the following types of tea (on average)?

	Never	Less than once a month	1-3 times a month	Once a week	2-4 times a week	5-6 times a week	Once a day	2-3 times a day	4-5 times a day	6+ times a day
Green tea (1 cup)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Black tea with or without milk (1 cup)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Iced tea (1 glass)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Decaffeinated tea (1 cup)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Think about **your own reasons** for drinking tea.

Read the following statements about the different reasons for tea consumption and consider whether you 'agree', 'strongly agree', 'disagree', 'strongly disagree'  
I drink tea...

	Strongly Agree	Agree	Disagree	Strongly Disagree
- because it is cheaper than other hot drinks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- because it is what I drink with food	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- to comfort and relax myself	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- for the warmth	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- for the taste	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- with friends	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- whenever it is offered to me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- for mental energy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- with family	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- out of boredom	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- because I feel I am influenced by peer pressure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- out of habit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- when I am stressed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

- because I feel that I am influenced by advertising	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- because it is easily available	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- to wake up	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- because others are drinking it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- as my culture influences me to drink it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- for energy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- when I have had enough coffee for the day	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- to replace food or meals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- while traveling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- because I think coffee has too much caffeine in it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- to improve physical performance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

End of Block: 5 -Tea

---

Start of Block: 6- Coffee



How often do you drink the following types of coffee (on average)?

	Never	Less than once a month	1-3 times a month	Once a week	2-4 times a week	5-6 times a week	Once a day	2-3 times a day	4-5 times a day	6+ times a day
Instant coffee (made with 1 teaspoon coffee powder)										
Plunger / drip coffee (1 medium cup - 250ml)										
Small espresso coffee (single shot)										
Large espresso coffee (double shot)										
Decaffeinated coffee (1 cup)										
Iced coffee (1 glass)										



Think about **your own reasons** for drinking coffee.  
 Read the following statements about the different reasons for coffee consumption and consider whether you 'agree', 'strongly agree', 'disagree' or 'strongly disagree'.  
 I drink coffee ...

	Strongly Agree	Agree	Disagree	Strongly Disagree
- because it is easily available	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- out of boredom	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- as a treat or luxury drink	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- because it is what I drink with food	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- to comfort and relax myself	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- for the warmth	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- for the taste	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- with friends	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- whenever it is offered to me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- because others are drinking it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- while traveling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- with family	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- when I am stressed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- while driving long distances	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

- for physical energy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- for mental energy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- for energy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- because I feel I am influenced by peer pressure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- because I feel that I am influenced by advertising	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- out of habit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- as my culture influences me to drink it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- to stay awake	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- to wake up	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- to replace food or meals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- when I am smoking	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- to improve physical performance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

End of Block: 6- Coffee

---

Start of Block: 7- Decaffeinated block



Think about **your own reasons** for drinking **decaffeinated** coffee / tea instead of regular coffee / tea.

Read the following statements about the different reasons for consumption and consider whether you 'agree', 'strongly agree', 'disagree' or 'strongly disagree'

I drink decaffeinated coffee / tea ...

	Strongly agree	Agree	Disagree	Strongly Disagree
- when I feel that I have had enough regular coffee / tea for the day	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- because I do not want the caffeine in regular coffee / tea	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- because it is offered to me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- because I can't tolerate the caffeine in regular coffee / tea	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- for medical reasons	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- because I prefer the taste of decaffeinated coffee / tea compared to regular	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other (please specify)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

End of Block: 7- Decaffeinated block

Start of Block: 8- Chocolate



How often do you eat the following types of chocolate (on average)?

The pictures below include some examples of products, chose the one closest to what you consume.

	Never	Less than once a month	1-3 times a month	Once a week	2-4 times a week	5-6 times a week	Once a day	2-3 times a day	4-5 times a day	6+ times a day
Milk Chocolate small bar (50g)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Milk Chocolate large block (200-250g)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dark Chocolate small bar (50g)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dark Chocolate large block (200-250g)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hot chocolate (1 medium cup)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Think about **your own reasons** for eating chocolate. Read the following statements about the different reasons for chocolate consumption and consider whether you 'agree', 'strongly agree', 'disagree' or 'strongly disagree'. I eat chocolate ...

Start of Block: 9- Kola Flavoured Drinks

	Strongly Agree	Agree	Disagree	Strongly Disagree
- to comfort and relax myself	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- for the taste	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- more when I am on my period	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- as a treat or luxury food	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- because I feel that I am influenced by advertising	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- with friends	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- with family	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- because it is already in many of the foods that I eat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- for the warmth (drinking chocolate)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- because I feel I am influenced by peer pressure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- while traveling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- to replace other food or meals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- whenever it is offered to me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

- out of boredom	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- when I am stressed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- because others are eating it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- out of habit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- because it is easily available	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- to improve physical performance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

End of Block: 8- Chocolate

---



How often do you drink the following types of kola-flavoured drinks (on average)? This includes brands such as Coca-Cola, Pepsi and other brands of kola-flavoured drinks. *'Diet', 'Zero', 'Max' varieties are included in their own category below ('diet'), rather than with 'regular' kola drinks.*

	Never	Less than once a month	1-3 times a month	Once a week	2-4 times a week	5-6 times a week	Once a day	2-3 times a day	4-5 times a day	6+ times a day
1 glass of regular kola drink (250ml)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1 can of regular kola drink (355ml)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1 small bottle of regular kola drink (600ml)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1 glass of DIET / ZERO / MAX kola drink (250ml)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1 can of DIET / ZERO / MAX kola drink (355ml)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1 small bottle of DIET / ZERO / MAX kola drink (600ml)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Think about **your own reasons** for drinking kola drinks (both regular and diet).  
Read the following statements about the different reasons for coffee consumption and consider whether you 'agree', 'strongly agree', 'disagree' or 'strongly disagree'.  
I drink kola drinks (both regular and diet) ...

	Strongly Agree	Agree	Disagree	Strongly Disagree
- because they are cheaper than other drinks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- because is the drink I have with meals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- because it is cold and refreshing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- for the taste	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- with friends	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- out of habit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- to replace food or meals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- for the bubbles / how it feels in my mouth	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- while traveling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- when I am stressed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- whenever it is offered to me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- for energy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- because they are easily available	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

- out of boredom	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- instead of coffee when the weather is hot	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- instead of alcohol	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- because others are drinking it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- with family	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- as a treat drink	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- as a mixer for alcohol	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- with takeaway food	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- because I feel that I am influenced by advertising	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- because I feel I am influenced by peer pressure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- to improve physical performance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

End of Block: 9- Kola Flavoured Drinks

---

Start of Block: 10- Energy Drinks / Energy Shots

Energy drinks include brands such as Red Bull, V, Mother, Monster Energy and others.



How often do you drink the following types of energy drinks (on average)?

	Never	Less than once a month	1-3 times a month	Once a week	2-4 times a week	5-6 times a week	Once a day	2-3 times a day	4-5 times a day	6+ times a day
1 energy shot	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1 small can of energy drink (250ml)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1 small bottle of energy drink (350ml)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1 large can / bottle of energy drink (500ml)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Think about **your own reasons** for drinking energy drinks.  
Read the following statements about the different reasons for coffee consumption and consider whether you 'agree', 'strongly agree', 'disagree' or 'strongly disagree'  
I drink energy drinks ...

	Strongly Agree	Agree	Disagree	Strongly Disagree
- because they are cold and refreshing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- for the taste	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- because I feel I am influenced by peer pressure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- out of habit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- for physical energy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- while driving long distances	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- with family	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- for energy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- whenever one is offered to me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- out of boredom	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- with takeaway food	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- to improve physical performance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- for mental energy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- instead of alcohol	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

- as a mixer for alcohol	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- when I am stressed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- because others are drinking it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- because I feel that I am influenced by advertising	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- to replace food or meals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- with friends	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- while traveling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- while smoking	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- with takeaway food	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- to stay awake	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- to wake me up	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- because they are easily available	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- because it is the drink I have with food	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

End of Block: 10- Energy Drinks / Energy Shots

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Start of Block: 11- RTDs

Caffeinated alcoholic RTDs are premixed alcoholic drinks with either a **kola base** (e.g. Jack Daniels, Jim Beam, Woodstock, Coruba and kola etc) or with **added caffeine or guarana** (e.g. some Smirnoff Ice, Purple Goanna). The pictures below include some examples of products, however there may be products not pictured. Chose the one closest to what you consume.



How often do you drink caffeinated RTDs (on average)?

	Never	Less than once a month	1-3 times a month	Once a week	2-4 times a week	5-6 times a week	Once a day	2-3 times a day	4-5 times a day	6+ times a day
1 RTD can (250-330ml)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1 RTD bottle (330 - 350ml)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Think about **your own reasons for** drinking Caffeinated RTDs.  
 Read the following statements about the different reasons for coffee consumption and consider whether you 'agree', 'strongly agree', 'disagree' or 'strongly disagree'.  
 I drink caffeinated RTDs ...

	Strongly Agree	Agree	Disagree	Strongly Disagree
- because they are cold and refreshing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- for the taste	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- for the alcohol content	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- because I feel I am influenced by peer pressure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- out of habit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- because I know how much alcohol is in them	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- whenever one is offered to me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- out of boredom	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- when I am stressed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- to replace food or meals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- to stay awake	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- for energy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- because I feel that I am influenced by advertising	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

- because others are drinking them	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- because they are easy to transport	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- with friends	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- while traveling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- with family	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- for physical energy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- because they are cheaper than other alcoholic drinks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- instead of spirits	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- to comfort and relax me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- to improve physical performance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

End of Block: 11- RTDs

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Start of Block: 12- Caffeinated Pre-workout Sports Supplements and Sports Gels



How often do you take caffeinated pre-workout sports supplements or sports gels (on

average)?

	Never	Less than once a month	1-3 times a month	Once a week	2-4 times a week	5-6 times a week	Once a day	2-3 times a day	4-5 times a day	6+ times a day
Pre-workout sports supplements	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sports gels	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Think about **your own reasons** for using sports supplements. Read the following statements about the different reasons for sports supplement consumption and consider whether you 'agree', 'strongly agree', 'disagree' or 'strongly disagree'. I take sports supplements ...\*

	Strongly Agree	Agree	Disagree	Strongly Disagree
- for physical energy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- because I feel that I am influenced by advertising	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- because of peer pressure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- because of pressure from coaches / trainers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- to improve physical performance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- as they are convenient to take	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- as a substitute for illegal drugs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- while traveling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- for energy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- to replace food or meals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- because they are easy to transport	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- because others are using them	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- out of habit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

- with friends



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**End of Block: 12- Caffeinated Pre-workout Sports Supplements and Sports Gels**

**Start of Block: 13- Caffeine Tablets**

Caffeine tablets include No Doz, Thermo, AllMax, Caffeine Pro, Inner Amour and others.



How often do you take caffeine tablets (on average)?

	Never	Less than once a month	1-3 times a month	Once a week	2-4 times a week	5-6 times a week	Once a day	2-3 times a day	4-5 times a day	6+ times a day
1 caffeine tablet containing 50mg of caffeine (e.g. Pro Plus)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1 caffeine tablet containing 100mg of caffeine (e.g. No Doz)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1 caffeine tablet containing 200mg caffeine (e.g. Thermo, AllMax, Myprotein Caffeine Pro, Inner Armor etc)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other (please specify)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Think about **your own reasons** for using caffeine tablets. Read the following statements about the different reasons for coffee consumption and consider whether you 'agree', 'strongly agree', 'disagree' or 'strongly disagree'. I take caffeine tablets ...

	Strongly Agree	Agree	Disagree	Strongly Disagree
- for physical energy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- because I feel I am influenced by peer pressure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- because of pressure from coaches / trainers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- as they are convenient to take	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- to replace food or meals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- to wake up	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- to improve physical performance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- for energy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- as a substitute for illegal drugs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- while traveling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- because others are using them	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- for mental energy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- while driving long distances	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

- because I feel that I am influenced by advertising	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- to stay awake	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- with friends	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

End of Block: 13- Caffeine Tablets

Start of Block: 15- Withdrawals and Intoxication

Think of your experiences with the caffeinated products that you have used. **Shortly after consuming** them, have you ever felt any of these effects?

	Tea	Coffee	Chocolate	Kola-flavoured drink	Energy drinks / shots	Caffeinated RTDs	Caffeinated sports supplements / sports gels	Caffeine tablets
Restlessness	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nervousness	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Excited	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sleep disturbances	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Thermal discomfort	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Urge to urinate	(	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Upset stomach	(	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Muscle twitching	(	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Difficulty concentrating	(	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fast or irregular heartbeat	(	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Increased energy	(	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Agitation or irritability	(	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other	(	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please tick all options that apply to you.

	I have never had concern about these effects	Worry or concern	Talking to someone about these effects	Seeking help to stop these effects	First aid being applied	Hospitalisation
Restlessness						
Nervousness						
Excited						

Sleep  
disturbances

Thermal  
discomfort

Urge to  
urinate

Upset  
stomach

Muscle  
twitching

Difficulty  
concentrating

Fast or  
irregular  
heartbeat

Increased  
energy

Agitation or  
irritability

Other

Have any of the effects mentioned above led to the following?

Select as many options as are relevant.



Did these negative effects impact on your social life, work life or cause you any kind of distress?

Yes

No

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Have you ever felt dependent on any of the following products?  
For example - you have felt that you needed them to 'feel normal' or to 'get through the day'.

- Tea
- Coffee
- Chocolate
- Kola-flavoured drinks (both regular and diet)
- Energy drinks / energy shots
- Caffeinated RTDs
- Caffeinated pre-workout sports supplements / sports gels
- Caffeine tablets
- No, I have never felt dependent on any of these products

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Think about your consumption of the caffeinated products that have been explored.  
Have you ever experienced any of the following symptoms **within one day of stopping their normal use**? Please tick all options that apply to you.

	Tea	Coffee	Chocolate	Kola-flavoured drink	Energy drinks / shots	Caffeinated RTDs	Caffeinated sports supplements / sports gels	Caffeine tablets
Headaches	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mood changes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tiredness or Drowsiness	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Difficulty concentrating	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nausea and vomiting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Muscle pain or stiffness	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Have any of the effects mentioned above led to the following?  
 Select as many options as are relevant.

	I have never had concern about these effects	Worry or concern	Talking to someone about these effects	Seeking help to stop these effects	First aid being applied	Hospitalisation
Headaches	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mood changes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tiredness or drowsiness	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Difficulty concentrating	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nausea or vomiting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Muscle pain or stiffness	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Did these negative effects impact on your social life, work life or cause you any kind of distress?

- Yes
- No

End of Block: 15- Withdrawals and Intoxication

Start of Block: 16- Why products are not consumed



For the following products, please select the main reasons why you might not consume them.

This includes products that you never consume but also ones that you may consume but not all of the time. Select the options that apply to you.

	I have never considered taking it	I don't like the flavour	There is too much sugar in it	I don't want to be dependent on it	I react badly to it	It isn't 'good' for me	It has too much caffeine in it	It's too expensive	I don't consume caffeine due to medical reasons
Tea	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Coffee	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chocolate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Kola-flavoured drinks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Energy drinks / energy shots	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Caffeinated alcoholic RTDs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Caffeinated sports supplements / sports gels	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Caffeine tablets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Is there any other reason why you don't consume these products? (Please specify product and reason if applicable)

- No
- Yes \_\_\_\_\_

End of Block: 16- Why products are not consumed

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Start of Block: 17- Social conventions and attitudes



The following are statements on attitudes and behaviours around caffeinated products. Read the following statements and consider whether you 'agree', 'strongly agree', 'disagree' or 'strongly disagree'.

	Strongly agree	Agree	Unsure	Disagree	Strongly disagree
When someone comes to my house, I should offer them a hot drink	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I give chocolate as a gift	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sometimes I 'go out for a coffee' but will drink something else that is not coffee.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is normal to always have kola-flavoured drinks in the fridge at home	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Kola-flavoured drinks are mainly for special occasions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Caffeinated RTDs are more socially acceptable way to drink alcohol than spirits	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is socially acceptable to drink kola drinks and energy drinks in the morning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Think about the following items. Which age group that you think of as being the main consumers for each product?  
Select as many options as apply.

	14 and under	15-18	19-30	31-50	51-70	70 and over	All age groups	Unsure
Tea	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Coffee	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chocolate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Kola drinks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Energy drinks / energy shots	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Caffeinated RTDs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Caffeinated pre-workout sports supplements / sports gels	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Caffeine tablets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Think about the following items: Which gender that you think of as the main consumer for each product?

	Male	Female	Both	Unsure
Tea	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Coffee	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Chocolate	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Kola drinks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Energy drinks / energy shots	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Caffeinated RTDs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Caffeinated pre- workout sports supplements / sports gels	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Caffeine tablets	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

End of Block: 17- Social conventions and attitudes

---

Start of Block: 18- Sport involvement

What sports or activities do you participate/compete in regularly throughout the year?  
Please select the level at which you predominantly compete at (for each selected sport).

	Recreational - non-competitive	Recreational - competitive	Representative - regional	Representative - national/international
Athletics / track and field	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Badminton	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Baseball / softball	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Basketball	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Combat sports	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cricket	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cycling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gymnastics	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hockey	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Multi-sport	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Netball	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Resistance / weight training	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Rowing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Rugby (all codes)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Running	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Snow sports	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Soccer/football	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Swimming	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tennis	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Do you regularly consume caffeine before or during these sports?

	Before	During	No
Athletics / track and field	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Badminton	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Baseball / softball	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Basketball	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Combat sports	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cricket	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cycling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Gymnastics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hockey	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Multi-sport	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Netball	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Resistance / weight training	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Rowing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rugby	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Running	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Snow sports	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Soccer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Swimming	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tennis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Please select the sources of caffeine consumed for your sport.  
Select as many options as are relevant.

	Tea	Coffee	Chocolate	Kola flavoured drinks	Energy drinks / Shots	Caffeinated RTDs	Caffeinated sports supplements	Caffeine sports gels	Caffeine tablets
Athletics / track and field	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Badminton	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Baseball / softball	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Basketball	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Combat sports	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cricket	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cycling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Gymnastics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hockey	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Multi-sport	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Netball	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Resistance / weight training	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Rowing	(	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rugby	(	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Running	(	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Snow sports	(	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Soccer	(	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Swimming	(	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tennis	(	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other	(	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

---

How many hours per week do you spend training and/or competing? (please estimate weekly average)

---

End of Block: 18- Sport involvement

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Start of Block: 19- Demographics



What is your ethnicity? You may choose as many that apply to you.

- European
  - NZ European
  - Maori
  - Samoan
  - Cook Islands Maori
  - Tongan
  - Niuean
  - Tokelauan
  - Fijian
  - Southeast Asian
  - Chinese
  - Indian
  - Korean
  - Middle Eastern
  - Latin American
  - African
  - Other (please specify)
- 



Employment status (choose more than one option if applicable):

- Student
- Unemployed
- Part time worker
- Full time worker



Does your job involve any of the following?

	Yes	No
Manual labour	<input type="radio"/>	<input type="radio"/>
Driving long distances	<input type="radio"/>	<input type="radio"/>
Shift work	<input type="radio"/>	<input type="radio"/>

---

What is your highest level of education completed or currently enrolled in?

- Primary school education
- Completed year 11 / 5th form
- Completed year 12 / 6th form
- Completed high school
- Diploma / Certificate
- Bachelors Degree
- Postgraduate degree



What is your living situation?

- Living alone
  - Living in a family home with others
  - Flatting with others
  - Other (please specify)
- 

Do you smoke?

- Yes
- No
- Prefer not to answer



Are you currently on any type of oral contraceptive?

- Yes
  - No
  - Prefer not to answer
- 

How much do you weigh (kg)?

- Kg - \_\_\_\_\_
  - Don't know / prefer not to answer
- 

How tall are you (cm)?

- Cm - \_\_\_\_\_
- Don't know / prefer not to answer

**End of Block: 19- Demographics**

---



## **Appendix C: Additional methods**

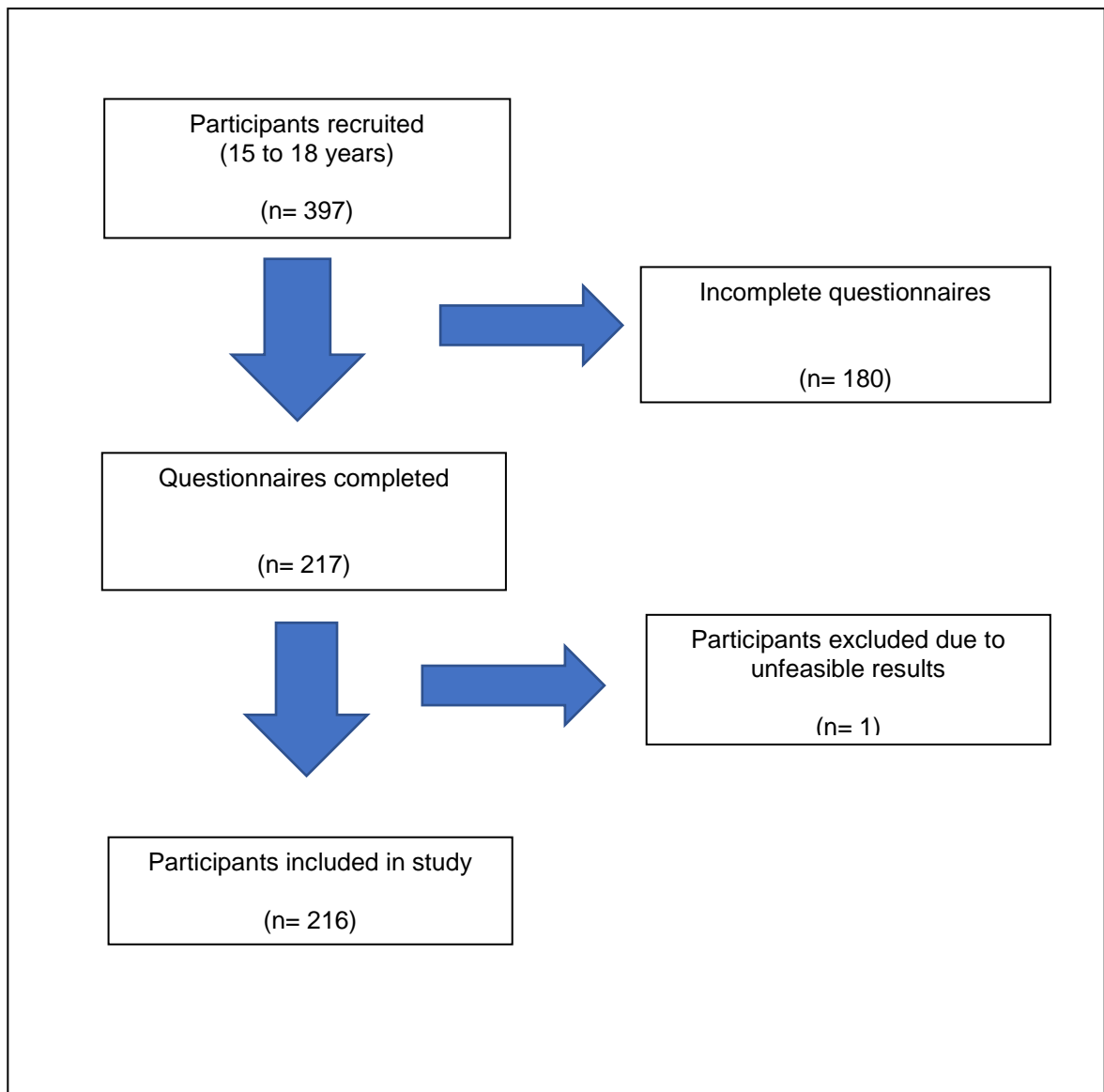
### **Participant recruitment**

An information sheet about the questionnaire and future uses of the data was provided on page one of the online questionnaire. Informed consent was gained from participants who agreed to complete the questionnaire by selection of a yes/no box.

As an incentive, participants who completed the online questionnaire were invited to provide their email address and go into a draw to win one of two monetary shopping vouchers. A total of 397 participants were recruited for the current study, however 180 participants failed to complete the questionnaire and their data was excluded.

Demographic information was captured at the end of the questionnaire and therefore it was not possible to determine whether the group of “non-completers” differed significantly in demographics (age, gender and/or ethnicity) from those who completed the questionnaire.

A further participant was excluded due to an unfeasible daily caffeine intake (participant reported consuming every caffeine source 6+ times per day). Data from 216 participants was analysed and included in this study. Figure 6.1 summaries the participant recruitment and inclusion process.



**Figure 6.1:** Diagram of participant recruitment

## Sources of caffeine available in New Zealand

There are a wide variety of caffeinated products available in New Zealand, including tea, coffee, soft drinks (kola, vitamin waters), alcoholic beverages, supplements and pharmaceuticals. The caffeine content of products is variable dependant on volume, preparation technique and methods use to brew beverages and the brand of the product for prepared items. Examples of average caffeine content available in New Zealand are provided in Table 6.1.

**Table 6.1 Average caffeine content for products available in New Zealand**

Product	Serving size	Estimated caffeine content (mg)
<b>Chocolate<sup>1</sup></b>		
Milk Chocolate	100g	20
Dark Chocolate	100g	60
Hot chocolate powder	1 teaspoon	1
<b>Tea<sup>1</sup></b>		
Green tea	250mL with 1 teabag	31
Black tea	250mL with 1 teabag	57
Decaffeinate black tea	250mL with 1 teabag	4.7
<b>Coffee<sup>1</sup></b>		
Plunger/drip coffee	250mL	120
Instant powder	1 teaspoon	83
Single shot espresso	Single shot	120
Double shot espresso	Double shot	210
Decaffeinated instant powder	1 teaspoon	1.9
<b>Kola drinks<sup>1</sup></b>		
Regular kola	100mL	11
Diet kola (diet, max, zero etc)	100mL	14
<b>Energy drinks<sup>2</sup></b>	100mL	31.2
<b>Energy shots<sup>2</sup></b>	60mL	162.2
<b>Caffeinated RTDs<sup>2,3</sup></b>	100mL	14.4
<b>Supplements/medications</b>		
Pre-workout <sup>4</sup>	100g	2110
Sports gel <sup>2</sup>	100g	77.7
Caffeine tablets <sup>3</sup>	1 tablet	50-200

<sup>1</sup> The New Zealand Institute for Plant and Food Research Limited and New Zealand Ministry of Health (2015)

<sup>2</sup> Thomson and Jones (2013)

<sup>3</sup> Beer Wine and Spirits Producers (2015)

<sup>4</sup>Supplements.co.nz (average content of 15 common products available)

\*Estimated caffeine content (actual content varies according to preparation and specific product)

Table adapted from Rowe (2015) and Stachyshyn (2017).

## Appendix D: Additional results

Table 6.2 Age and gender of study participants

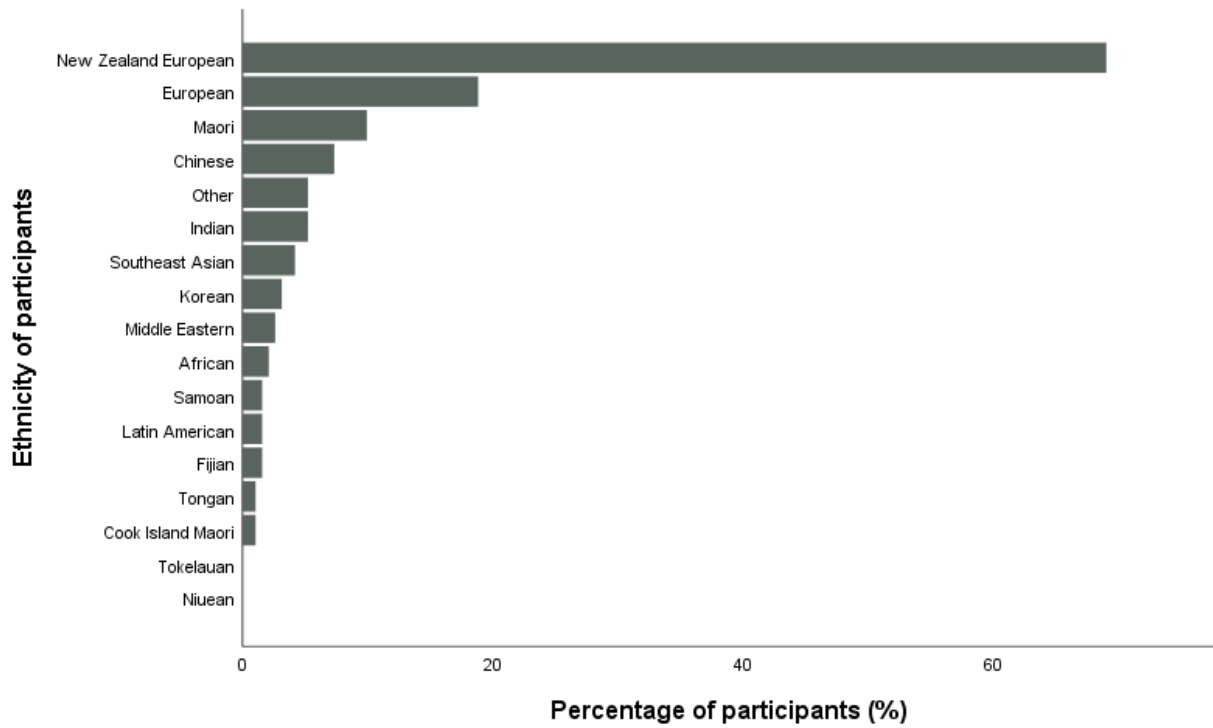
Age	Male		Female		Total	
	n	(%)	n	(%)	n	(%)
15 years	5	(2.3)	7	(3.2)	12	5.6
16 years	30	(13.9)	35	(16.2)	65	30.2
17 years	14	(6.5)	53	(24.5)	68	31.6
18 years	10	(4.7)	15	(6.9)	25	11.6
16-18 years (unspecified) <sup>1</sup>	16	(7.4)	29	(13.4)	45	20.9
<b>Total n</b>	75	34.7%	139	64.8%	214	100

<sup>1</sup>Note: a previous version of the CaffCo questionnaire had participants select their age group rather than enter their age

### Additional participant characteristics

#### *Ethnicity*

Participants ethnicity are displayed in Figure 1. The participants major ethnic groups were: 69.3% New Zealand European (n= 133), 19.8% Asian (Chinese, Indian, South East Asian and Korean; n=38), 18.8% European (n= 36), 9.9% Māori (n= 19) and 5.2% Pacifica Peoples (Fijian, Tongan, and Cook Island Maori; n= 10). Study participants were able to select multiple ethnicities; therefore, the total is greater than 100%.



**Figure 6.2 Ethnicity of participants (n= 133)**

***Employment***

Participants were asked about their employment status at the time of the study. Just over one third (35.9%) of participants were in paid employment (either part or full time) in addition to studying; with the remaining two thirds (64.1%) were unemployed.

### Body Mass Index (BMI)

Almost three quarters (73.7%) of participants reported a normal BMI (n= 98), 9.8% of participants were underweight (n= 13) and the remaining 16.6% of participants were overweight or obese (n= 22). There was no association between gender and body mass index, for both men and women participants the median BMI was 21.26 kg·m<sup>-2</sup> (U=1968.5, p=0.702). Sources of caffeine

Table 6.3 Comparison of consumption of caffeine source by BMI group

Caffeine source	Underweight (%) (n= 13)	Normal (%) (n= 98)	Overweight or obese (%) <sup>1</sup> (n= 22)	Pearson Chi-square test ( $\chi^2$ )	p-value*
Tea	28.6	65.0	65.2	7.048	0.029
Coffee	57.1	59.0	65.2	0.349	0.840
Chocolate <sup>+</sup>	92.9	89.0	87.0	0.312	0.856 <sup>+</sup>
Kola drinks	57.1	58.0	52.2	0.259	0.878
Energy drinks	21.4	39.0	43.5	1.968	0.374
Caffeinated RTDs <sup>+</sup>	21.4	30.0	8.7	4.601	0.100 <sup>+</sup>
Sports supplements <sup>+</sup>	0	5.0	0	1.920	0.383 <sup>+</sup>
Consumes no caffeine <sup>+</sup>	7.1	2.0	4.3	1.345	0.510 <sup>+</sup>

\*Pearson's chi-square test

<sup>1</sup>Overweight and obese categories combined due to low number of participants in obese group

<sup>+</sup>Test not valid as expected count <5.

### Caffeine intake by source

Figure 6.3 is a box plot showing the distribution of estimated individual daily consumption by caffeine source. Coffee had the largest variation of estimated daily intake, with a median intake of 10.7 mg·day<sup>-1</sup> [0.0-88.6 mg·day<sup>-1</sup>], with a maximum of 743.8 mg·day<sup>-1</sup>. There was also a large variation in the intake of energy drinks, with a median intake of 0.0 mg·day<sup>-1</sup> [0.0-2.6 mg·day<sup>-1</sup>], but a maximum of 324 mg·day<sup>-1</sup>. This suggests that of participants who drink energy drinks, there exists a group of heavy users. Tea had an estimated daily intake of 2.6 mg·day<sup>-1</sup> [0.0-24.9 mg·day<sup>-1</sup>]. Chocolate was also a substantial contributor to daily caffeine intake, with a median estimated daily intake of 5.7 mg·day<sup>-1</sup> [1.6-10.2 mg·day<sup>-1</sup>] despite the lower caffeine content of chocolate.

Kola drinks contributed a median estimated daily intake of 1.8 mg·day<sup>-1</sup> [0.0-8.8 mg·day<sup>-1</sup>]. The median estimated daily intakes for caffeinated RTDs and caffeinated sports supplements and gels were both 0.0 mg·day<sup>-1</sup> [0.0-0.0 mg·day<sup>-1</sup>].

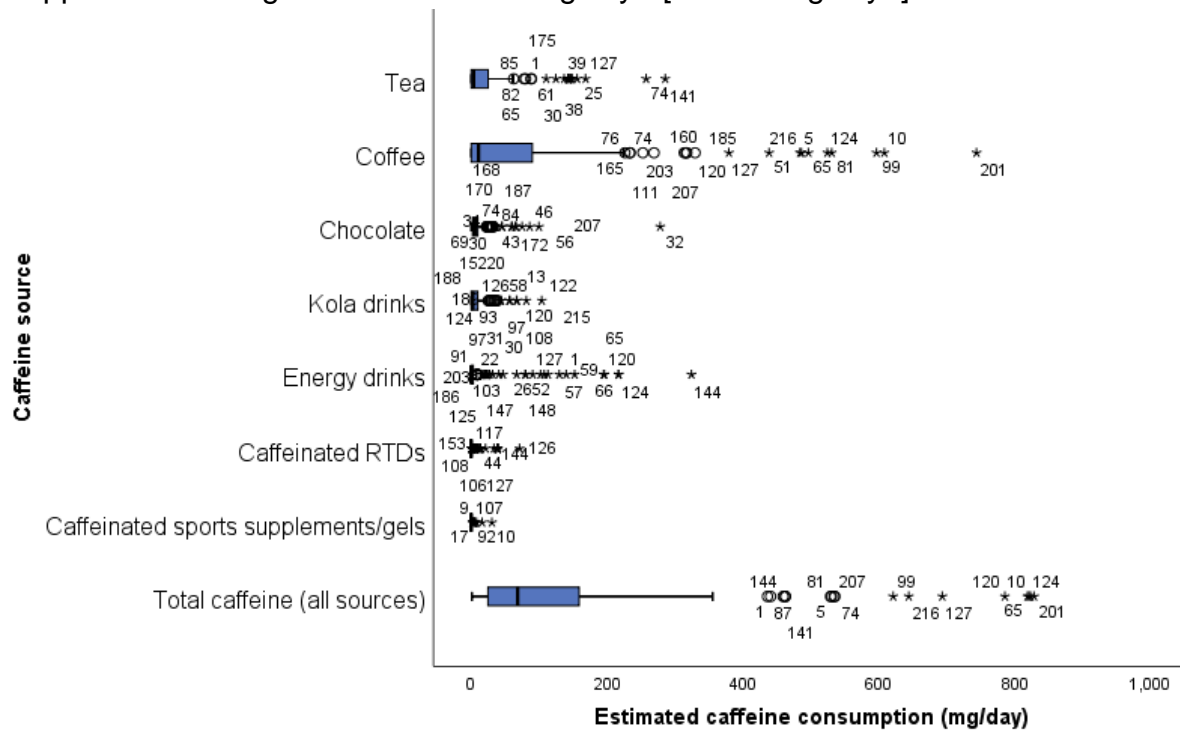


Figure 6.3 Box plot showing participant's daily caffeine intake by source



**Table 6.4 Daily caffeine intake by source for those consuming above or below the adverse effect level of 3 mg·kg<sup>-1</sup>·day<sup>-1</sup>**

<b>Caffeine source</b>	<b>Below adverse effect level (mg·day<sup>-1</sup>) (n=117)</b>	<b>Above adverse effect level (mg·day<sup>-1</sup>) (n=35)</b>	<b>Mann-Whitney test statistic (U)</b>	<b>p-value</b>	<b>Effect size</b>
<b>All sources</b>	49.889	355.392	18.0	>0.001	-0.72043
<b>Tea</b>	2.476	29.544	1006.5	>0.001	-0.38025
<b>Coffee</b>	3.528	218.131	432.0	>0.001	-0.59097
<b>Chocolate</b>	6.233	9.763	1385.0	0.004	-0.23522
<b>Kola type drinks</b>	2.253	10.582	1370.0	0.002	-0.24909
<b>Energy drinks</b>	0.000	3.182	1476.0	0.004	-0.23108
<b>Caffeinated RTDs</b>	0.000	0.000	1727.5	0.073	-0.14543
<b>Caffeinated sports supplements</b>	0.000	0.000	2029.5	0.855	-0.01484

Values are medians [25th, 75th percentile]

\*Mann-Whitney test used

+Significant result (P < 0.05)

## Motivations for caffeine consumption

### Tea

The main reasons for tea consumption (based on percentage of positive (agree or strongly agree) responses) were; “For the taste” (90.1%), “For the warmth” (88.4%), “To comfort and relax myself” (88.4%), “Whenever it is offered to me” (81.0%), and “because it is easily available” (79.3%) (Figure 6.4).

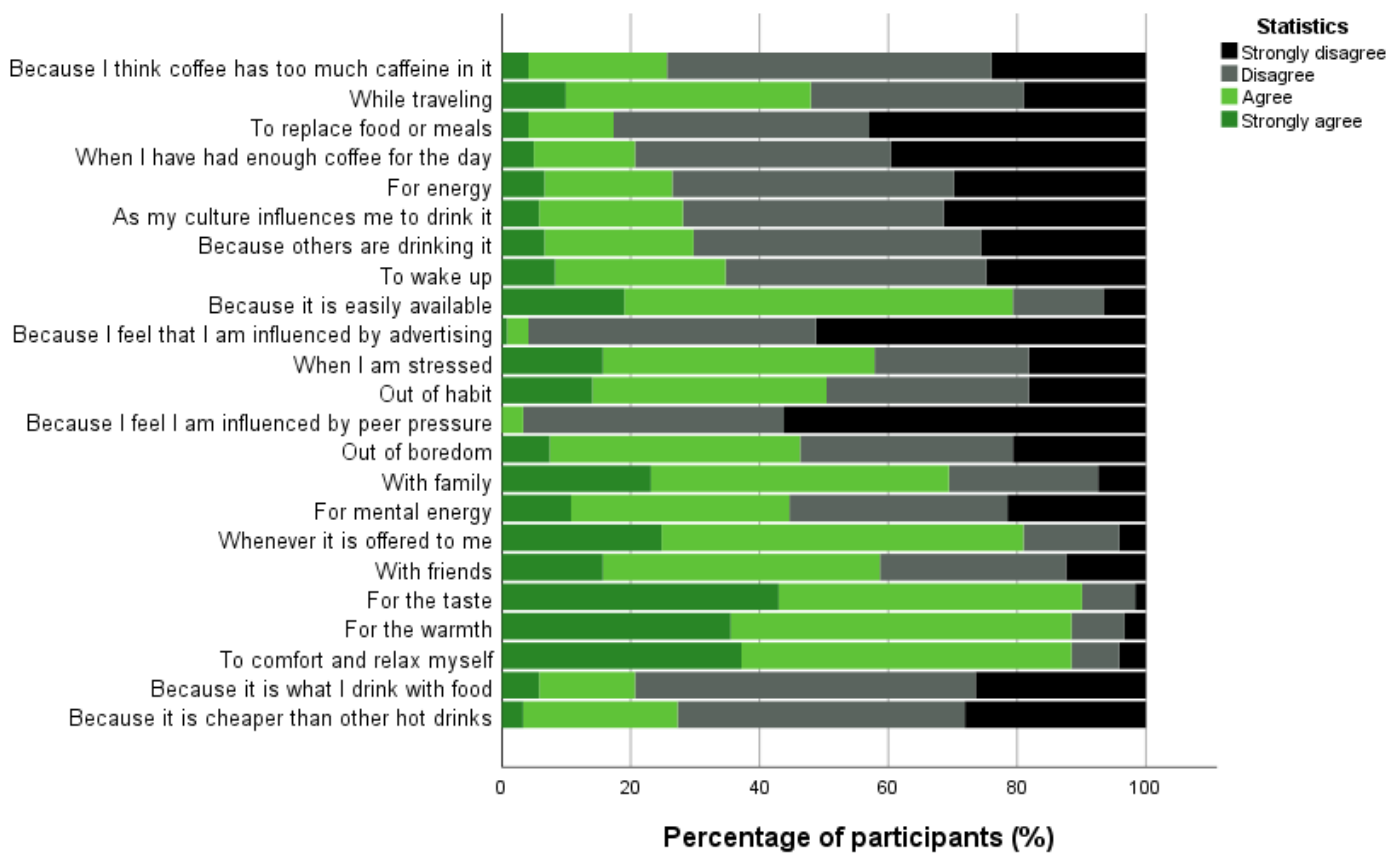


Figure 6.4 Motivations for consuming tea

## Coffee

The main reasons for coffee consumption (based on the percentage of positive responses) were; “To wake up” (87.7%), “For the taste” (87.7%), “To stay awake” (85.3%), “For energy” (83.6%), “For the warmth” (81.20%) (Figure 6.5).

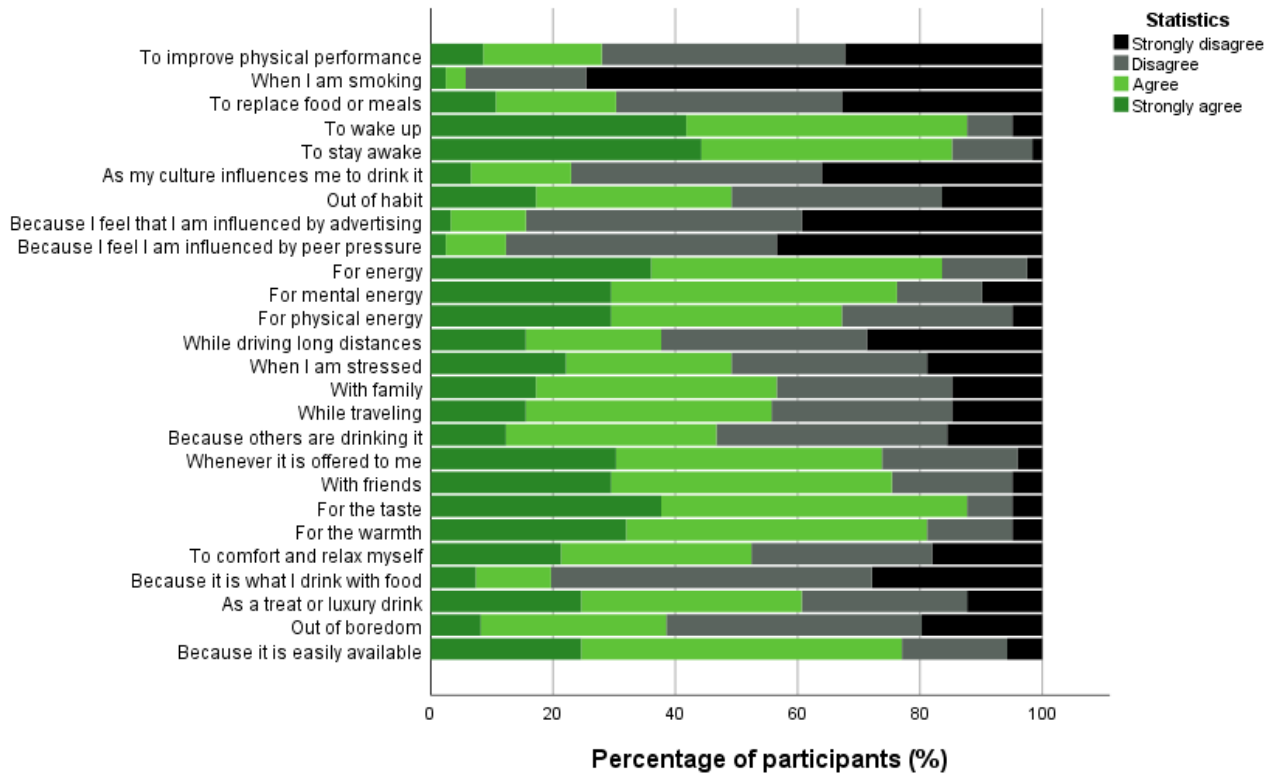


Figure 6.5 Motivations for consuming coffee

## Chocolate

The main reasons for chocolate consumption were; “For the taste” (97.3%), “As a treat” (87.7%), and “With friends” (84.4%) (Figure 6.6).

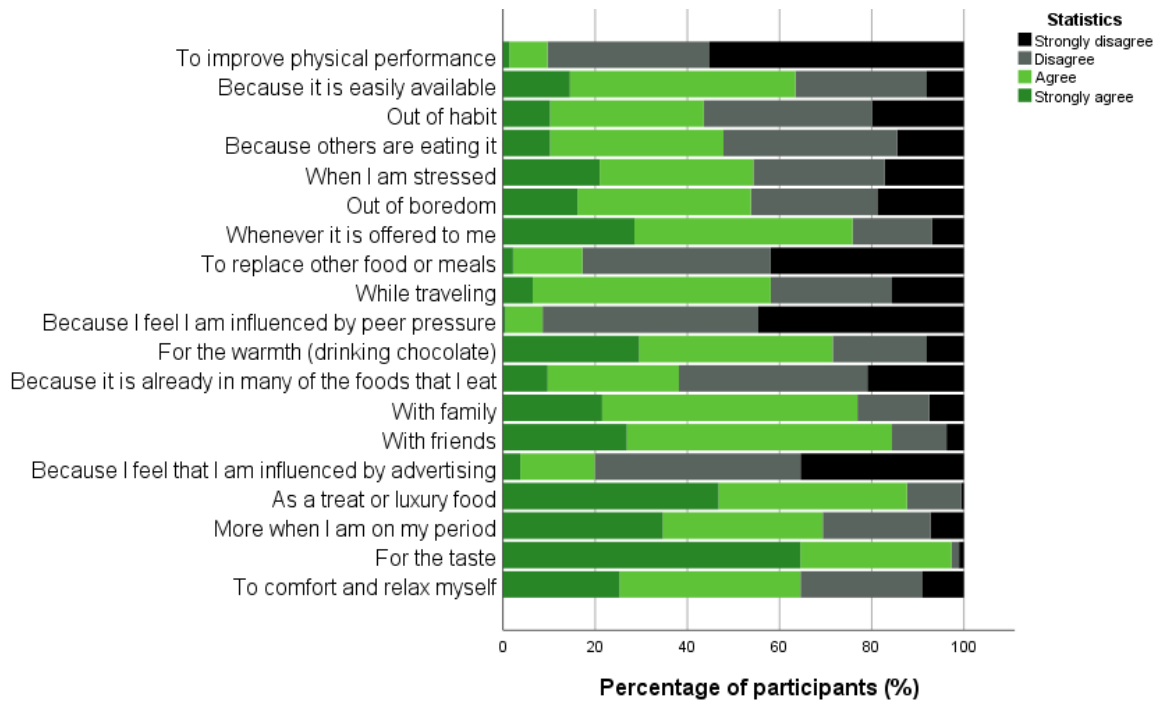
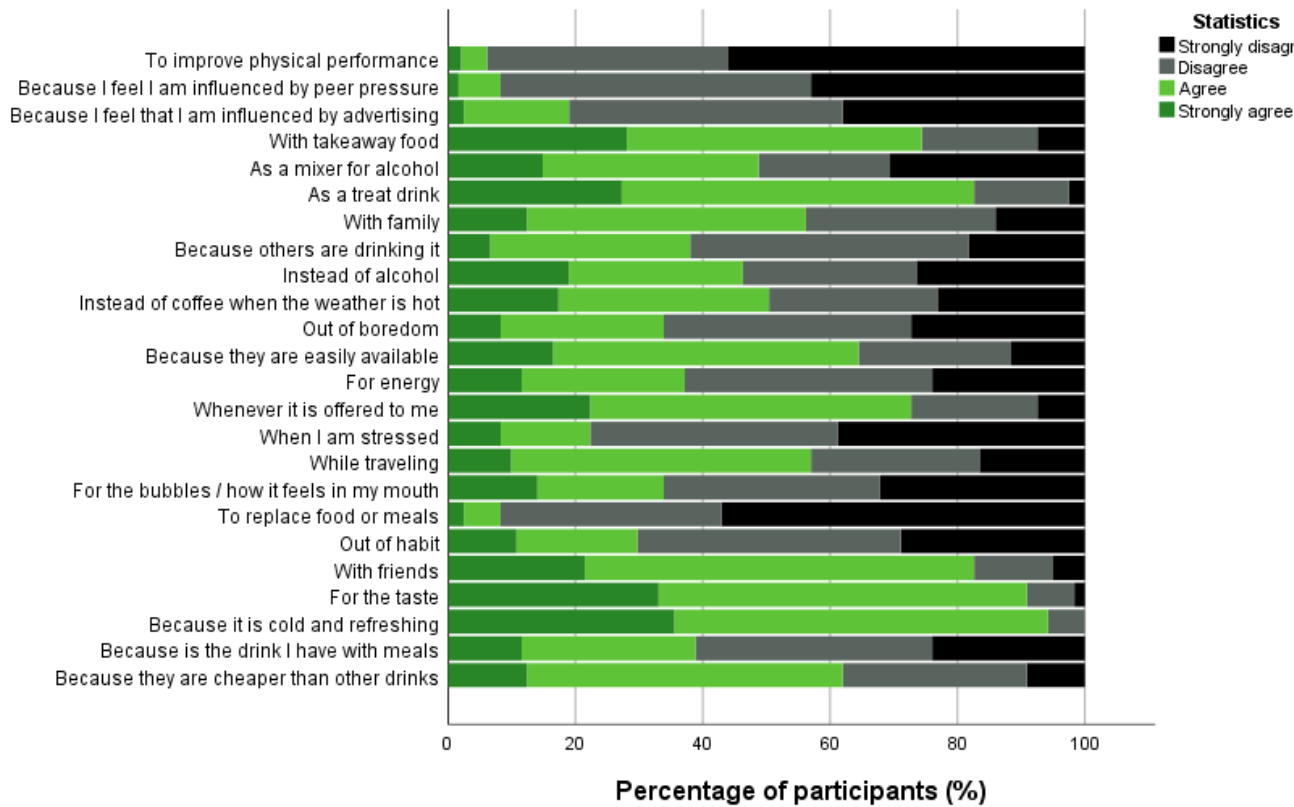


Figure 6.6 Motivations for consuming chocolate

### ***Kola drinks***

The main reasons for kola drinks consumption were; “Because it is cold and refreshing” (94.2%), “For the taste” (91%), “With friends” (82.7%), and “As a treat drink” (82.7%) (Figure 6.7).



**Figure 6.7 Motivations for consuming kola drinks**

### Energy drinks

The main reasons for energy drinks consumption were; “For energy” (85.0%), “To stay awake” (82.2%), “Because they are cold and refreshing” (73.9%), “For the taste” (72.6%), “For physical energy” (72.6%), and “To wake me up” (72.6%) (Figure 6.8).

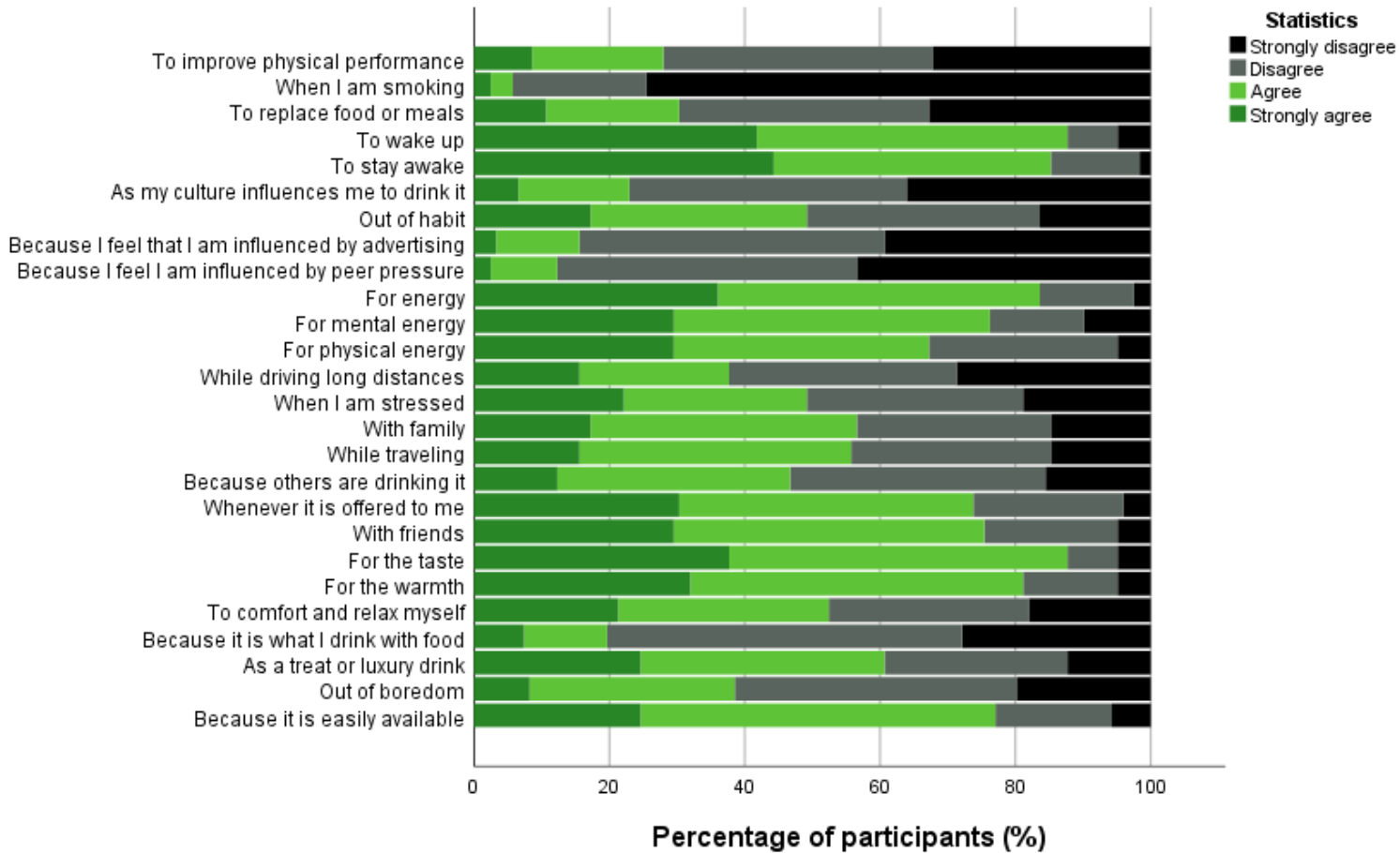
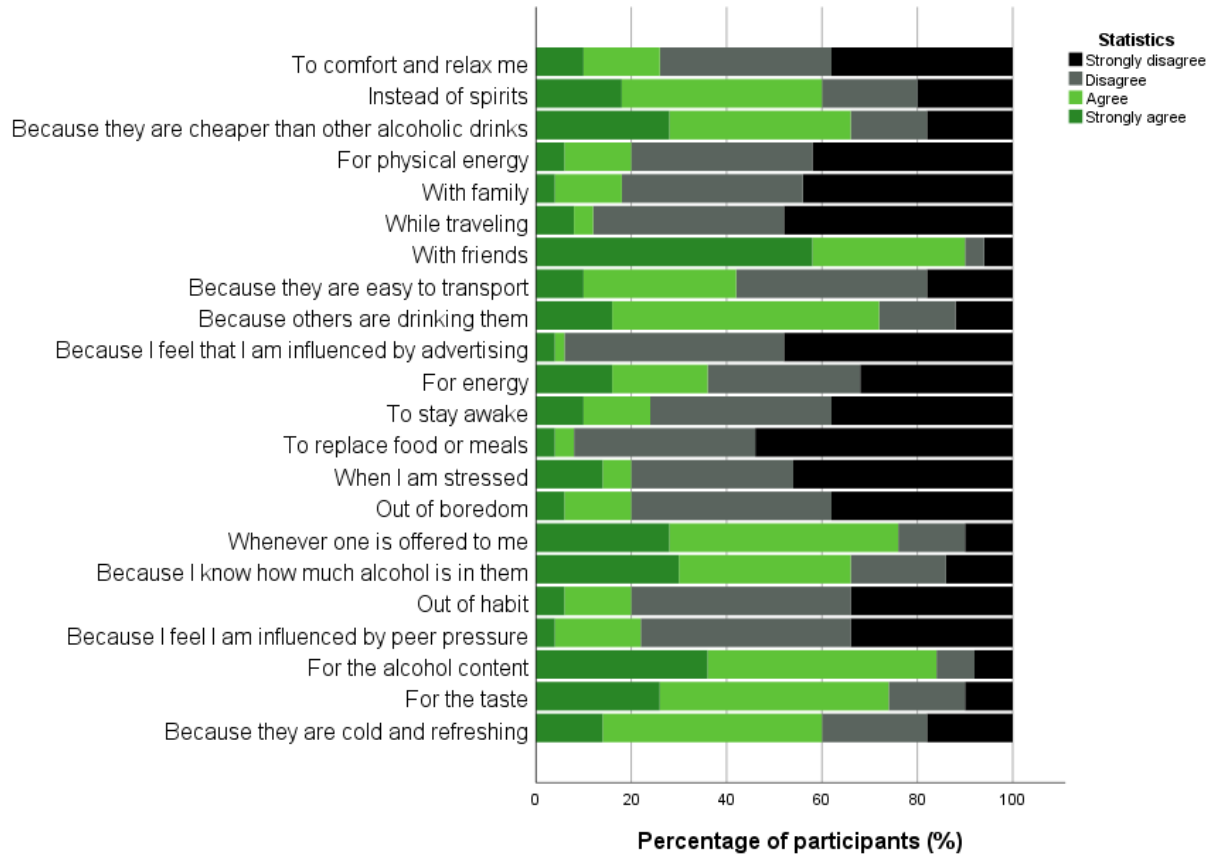


Figure 6.8 Motivations for consuming energy drinks

**Caffeinated Ready-to-drink beverages**

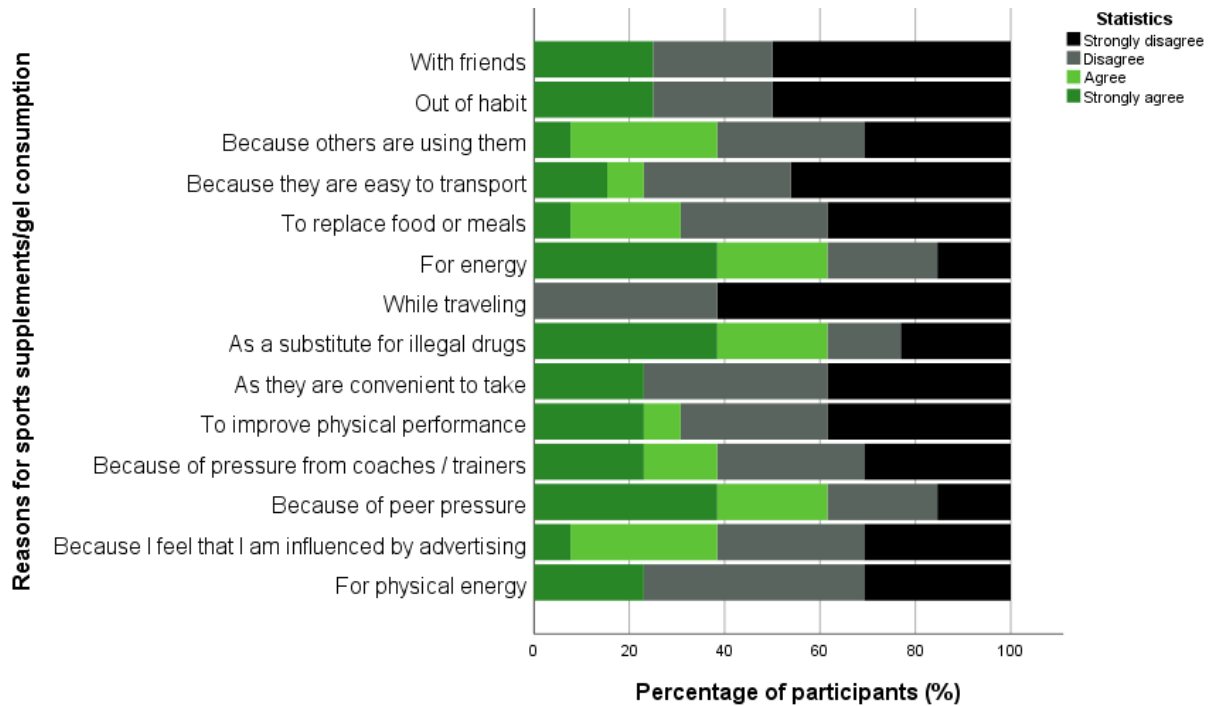
The main reasons for caffeinated RTD consumption were; “With friends” (90.0%), “For the alcohol content” (84.0%), “Whenever one is offered to me” (76.0%), “For the taste” (74.0%), and “Because others are drinking them” (72.0%) (Figure 6.9).



**Figure 6.9 Motivations for consuming caffeinated RTDs**

**Sports supplements/gels**

The main reasons for sports supplements or gels consumption were; “Because of peer pressure” (61.2%), “As a substitute for illegal drugs” (61.2%), and “For energy” (61.2%). It is important to note however, that there was less agreement between participants for the reasons they consumed caffeinated sports supplements and gels, as the most frequent responses were selected by only 61.2% participants, whereas the top responses for other sources were selected least 72% of consumers (Figure 6.10).

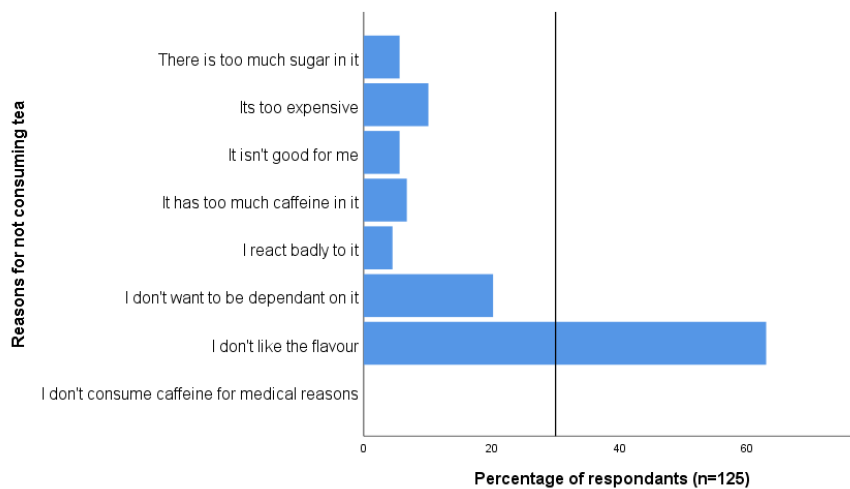


**Figure 6.10 Motivations for consuming caffeinated RTDs**

## Non-consumption of caffeinated products

### Tea

Participants (n= 106) that indicated they infrequently or never consumed tea reported the main reason they do not drink tea was that they “don’t like the flavour” (58.8% of respondents). Additionally, 17.0% of respondents reported that they don’t want to be dependent on tea. And 20.8% of respondent “had never considered taking [tea]” (Figure 6.11).



**Figure 6.11 Reasons for non-consumption of tea**

### Coffee

Participants (n= 150) who infrequently or never consumed coffee reported the main reason they do not drink coffee were that they “don’t want to be dependent on it” (45.3% of respondents) and “don’t like the flavour” (31.3% of respondents) (Figure 6.12).

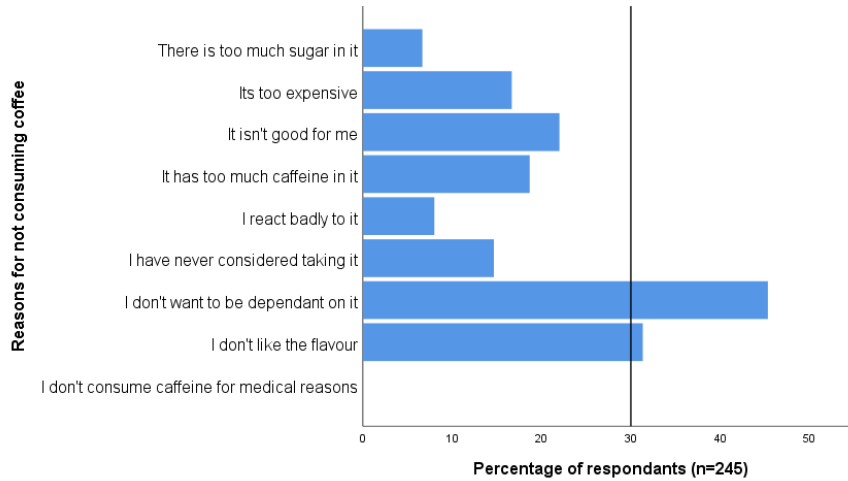


Figure 6.12 Reasons for non-consumption of coffee

### Chocolate

Participants (n= 127) who infrequently or never consumed chocolate reported the main reason they do not eat or drink chocolate was that they “there is too much sugar in it” (61.4% of respondents) and “it isn’t good for me” (54.3% of respondents) (Figure 6.13).

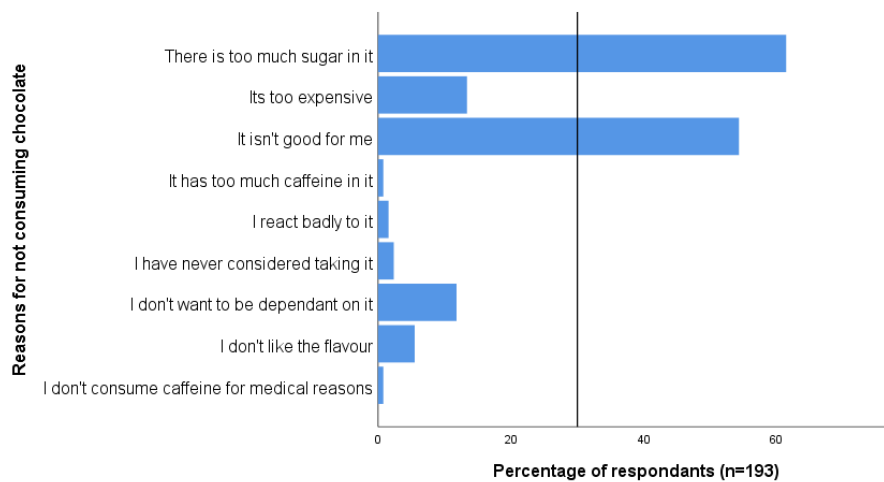
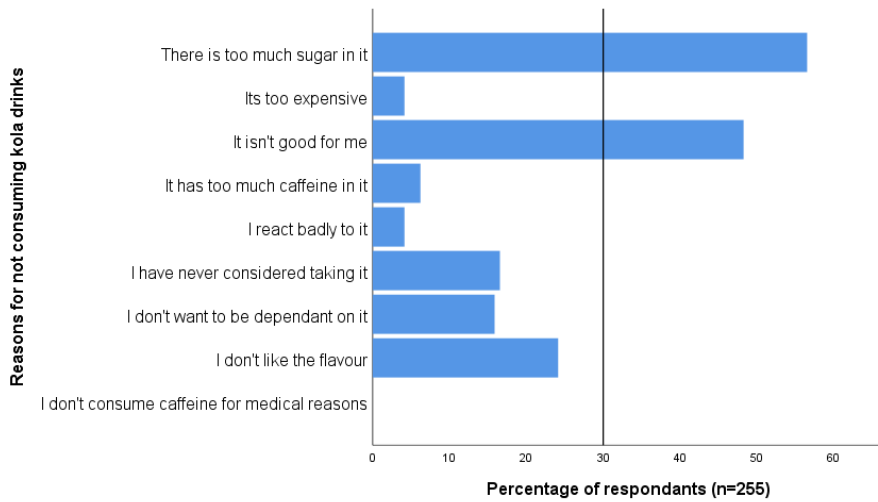


Figure 6.13 Reasons for non-consumption of chocolate

### ***Kola drinks***

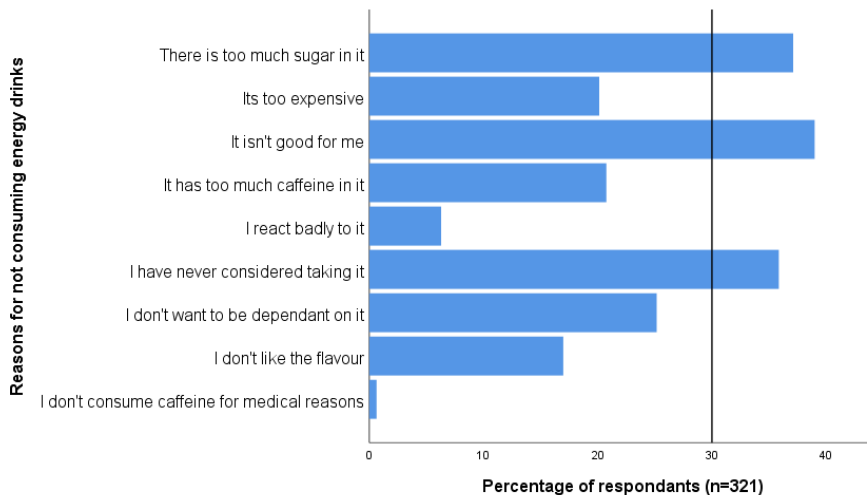
Participants (n= 145) that indicated they infrequently or never consumed kola drinks reported the main reasons they do not drink kola drinks were that “there is too much sugar in it” (56.6% of respondents) and “it isn’t good for me” (48.3% of respondents) (Figure 6.14).



**Figure 6.14 Reasons for non-consumption of kola drinks**

### ***Energy drinks***

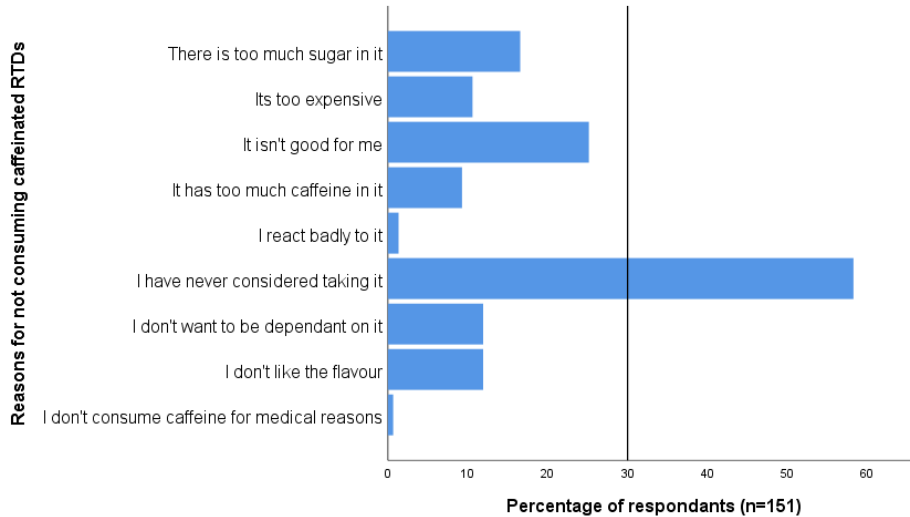
Participants (n= 159) that indicated they infrequently or never consumed energy drinks reported the main reasons they do not drink energy drinks were that “it isn’t good for me” (39.0% of respondents), “there is too much sugar in it” (37.1% of respondents), and “I have never considered taking it” (35.8% of respondents) (Figure 6.15).



**Figure 6.15 Reasons for non-consumption of energy drinks**

### **Caffeinated RTDs**

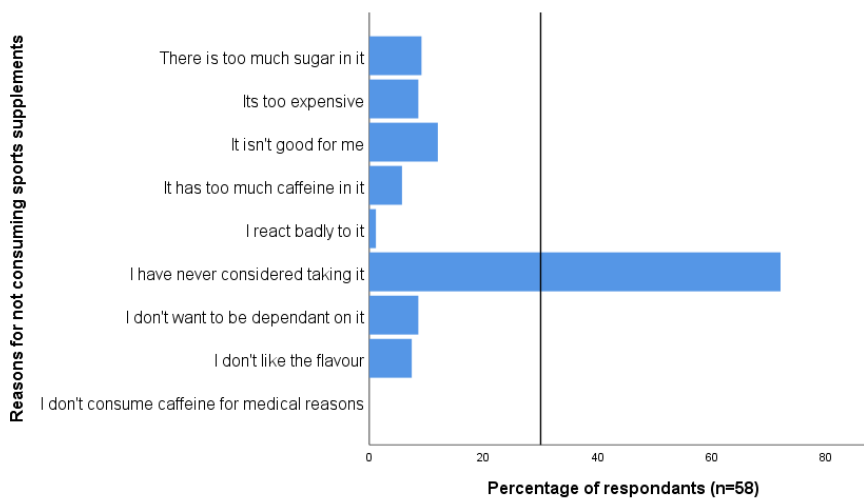
Participants (n= 151) who infrequently or never consume caffeinated RTD beverages reported the main reason they do not drink caffeinated RTDs was “I have never considered taking it” (58.3% of respondents) (Figure 6.16).



**Figure 6.16 Reasons for non-consumption of caffeinated RTDs**

### **Caffeinated sports supplements/gels**

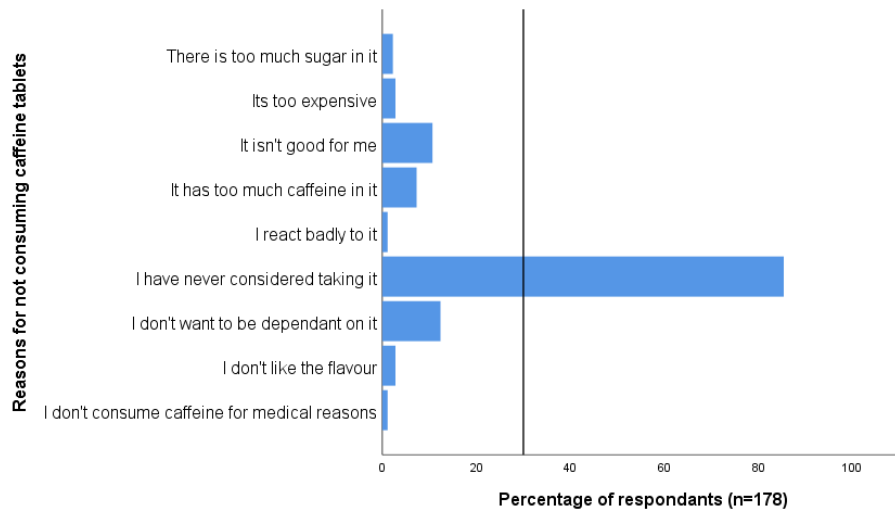
Participants (n= 58) who infrequently or never consume caffeinated sports supplements or gels reported the main reason they do not use caffeinated sports supplements or gels is because “I have never considered taking it” (72.0% of respondents) (Figure 6.17).



**Figure 6.17 Reasons for non-consumption of sports supplements/gels**

### **Caffeine tablets**

Participants (n= 178) who infrequently or never consume caffeine tablets reported the main reason they do not use caffeine tablets is because “I have never considered taking it” (85.4% of respondents) (Figure 6.18).



**Figure 6.18 Reasons for non-consumption of caffeine tablets**