

# Tea Consumption And Well-Being: A Comprehensive Analysis Of Physical, Psychological, And Social Impacts

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## Abstract

Tea (*Camellia sinensis*) is one of the most widely consumed beverages worldwide, and rich in polyphenols, L-theanine, caffeine, flavonoids, and other bioactive compounds. Recent research has increasingly explored how tea consumption influences not only physical health but also mental health and social health. This review explores evidence from observational studies, randomized controlled trials (RCTs), meta-analyses, and mechanistic experiments about the impact of tea consumption on several aspects of human life. Meta-analyses for physical health outcomes indicate that higher tea consumption is associated with reduced cardiovascular mortality, lower risk of metabolic syndrome, modest improvements in blood pressure and lipid profiles, and reduced fracture risk. Mental health effects as per RCTs and meta-analyses show that Tea consumption improves mood, attention, reaction time, and sleep quality and helps in managing anxiety and depressive symptoms. In context to social health, habitual tea drinking is linked to better health-related quality of life. The need of the hour is to further analyze the impact of tea consumption on human life particularly in context to social well-being of humans.

**Keywords:** Tea; *Camellia sinensis*; Polyphenols; L-theanine; Physical health; Social well-being Health-related quality of life.

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## INTRODUCTION

Tea, derived from the leaves of *Camellia sinensis*, is the most widely consumed beverage after water and has been a cornerstone of human culture for over 4,000 years. Its varieties such as green, black, oolong, and white are dependent on the method of processing and fermentation<sup>1</sup>. While green and white teas are minimally processed and non-oxidized, (thereby retaining higher levels of catechins and other polyphenols), oolong tea undergoes partial oxidation and black tea is fully oxidized (leading to the formation of complex flavonoids such as theaflavins and thearubigins). These differences in processing not only influence the flavour, aroma, colour of tea but also its potential health effects<sup>2</sup>.

Amongst all the countries in the world, India and China are the top producers of tea and thus is an integral component of the economic and social sectors of these countries. The principal constituents of tea are polyphenols, especially flavonoids such as catechins (epigallocatechin gallate, EGCG; epicatechin; epigallocatechin) in green tea and their oxidized derivatives, theaflavins and thearubigins, in black tea. These molecules exhibit potent antioxidant and anti-inflammatory properties. These are also responsible for scavenging the reactive oxygen species (ROS), and modulation of redox-sensitive signalling pathways<sup>3</sup>. Other important constituents include methylxanthines such as caffeine and theophylline, which exert stimulatory and metabolic effects; amino acids such as L-theanine, known for its anxiolytic actions; polysaccharides with anti-diabetic potential; and a spectrum of alkaloids and micronutrients. It is in fact the synergistic effect of all the components which is responsible for all the pharmacological actions of tea<sup>4</sup>.

Historically, tea finds a special mention in traditional medicine systems, particularly Indian Ayurveda in Traditional Chinese Medicine where one can find it to be prescribed to patients for improving digestion, enhancing alertness, promoting longevity and in general for overall physical well-being of humans<sup>5</sup>. One

major aspect of tea consumption which cannot be ignored is its significant role in social well-being of an individual, thereby improving the Quality of Life<sup>6</sup>.

Modern biomedical research done in the past in the form of clinical trials and longitudinal studies has also verified both physical and social benefits of tea consumption, thereby further strengthening the traditional claims<sup>7</sup>. However, there are some research gaps still left over mostly due to inconsistent study designs and the multiple effects tea can have on physical and social well-being of humans.

This review aims to provide a comprehensive evaluation of tea's mechanism of action, appropriate doses and its multidimensional impact on human health based on the literary evidence found in the ancient scriptures as well as on several evidence based studies done in the past. By highlighting the multifaceted effects of tea on physical, mental and social health domains, this article seeks to draw attention of the readers on the impact of tea consumption not only as a daily dietary component but also as integral component of rich cultural heritage.

### **Mechanisms of Action of Tea**

Literature is full of evidence in context to the antioxidant and anti-inflammatory effects of tea which may exhibit its action through neurochemical, endocrine or vascular pathways.<sup>8</sup>

The polyphenols present in tea such as EGCG possess antioxidant properties and these primarily act by scavenging free radicals and upregulating endogenous antioxidant enzymes (superoxide dismutase and glutathione peroxidase) thereby reducing the oxidative stress. The polyphenols also suppress pro-inflammatory signaling pathways, including NF- $\kappa$ B and MAPK cascades, thereby attenuating the production of cytokines such as TNF- $\alpha$ , IL-1 $\beta$ , and IL-6<sup>9</sup>.

Amino acids (L-theanine), exert psychoactive effects by crossing the blood-brain barrier and modulating neurotransmitter balance. L-theanine increases inhibitory neurotransmitters such as GABA, thereby promoting mental relaxation.<sup>10</sup>

Caffeine, a methylxanthine antagonizes the adenosine receptors, and exhibits synergistic effect with L-theanine resulting in a state of calmness and reduced mental fatigue.<sup>11</sup>

The active ingredients of tea influence the endocrine and stress pathways. Catechins and theanine regulate the hypothalamic-pituitary-adrenal (HPA) axis. This is partly responsible for anxiolytic effects of tea.<sup>12</sup> These ingredients also impact the gut-brain axis. Tea polyphenols stimulate the growth of beneficial bacteria such as Bifidobacteria and Lactobacilli and inhibit the growth of pathogenic species. These microbial shifts increase the production of short-chain fatty acids, which exert anti-inflammatory, metabolic and neuroactive effects<sup>13</sup>.

Tea polyphenols and theaflavins improve endothelial function by enhancing the bioavailability of nitric oxide which further reduces arterial stiffness and improves vasodilation. This in turn helps in blood pressure regulation and improved perfusion. The polyphenols also modulate lipid metabolism, collectively lowering the risk of atherosclerosis<sup>14</sup>.

It would be appropriate to say that the effects of tea are actually a synergistic interplay of all its bioactive compounds which act on multiple physiological systems<sup>15</sup>. This explains its broad-spectrum influence on physical, mental, and even social health outcomes.

### **Dosage, Tea Types, and Safety Considerations**

The health benefits of tea consumption depend on both the type of tea consumed and the amount ingested on a daily basis.

Studies have suggested that a moderate consumption of 2–4 cups per day is associated with improved cardiovascular, metabolic, and cognitive outcomes. Green tea, which is rich in catechins, is known for its antioxidant properties, while black tea, with higher theaflavin content, helps in improvising the cardiovascular health.<sup>16</sup> Higher intakes, particularly above 8–10 cups daily leads to deleterious side effects, such as anxiety, restlessness, insomnia, palpitations, and gastrointestinal upset. These effects are due to high caffeine exposure. So pregnant women and young children need to be extra cautious in context to excessive consumption of tea.<sup>17</sup>

Tea also contains tannins that can bind to dietary non-heme iron, thereby reducing its absorption.<sup>18</sup> This is particularly important to for persons suffering from iron-deficiency anaemia, children, and pregnant women. To reduce this interference, tea can be consumed between meals rather than with iron-rich foods. The temperature at which tea is consumed definitely plays an important role in safety. Regular

consumption of very hot tea (above 65°C) has been shown to be associated with an increased risk of esophageal cancer, hence utmost care must be taken in this aspect<sup>19</sup>.

In overall, tea is considered safe for consumption when consumed in moderate amounts and at appropriate temperature.

### Effects of Tea on Physical, Mental, Occupational and Social Health

#### A. Physical Health Effects

All types of tea are associated with several positive physical-health outcomes It has been observed that regular tea intake in moderate amount, reduces the risks of coronary artery disease (CAD).<sup>20</sup> Also an inverse relationship has been seen between tea consumption and incident type 2 diabetes.<sup>21</sup>

As far as weight loss on consumption of green tea is concerned, the observations are not conclusive, although mild to moderate fat loss has been observed.<sup>22-23</sup>.

It has also been observed that green tea lowers low density lipoprotein (LDL) cholesterol and Total Cholesterol (TC) of the subjects and thus has a definite potential in improving the overall health of the patient and reducing the risk of CAD<sup>24</sup>. As far as the antihypertensive effects of tea are concerned, the effect has been found to be mild to moderate, but the data lacks any definite conclusion remarks.<sup>25</sup> Table 1 summarizes the key research papers, systematic reviews and meta-analyses pertaining to the effects on tea on various physical health parameters.

**Table 1: Representative Studies on Tea and Physical Health**

S No.	Citation	Study Design	Outcome measured	Key finding
1	Deka A, Vita JA.2011 <sup>20</sup>	Review on Epidemiological studies	CAD	Mild to moderate effect. No definitive Conclusion
2	Huxley R, Lee CM. 2009 <sup>26</sup>	Systematic Review with Meta-analysis	Type 2 diabetes	Tea intake associated with lower Type 2 diabetes risk
3	Zhang Yiyi et al.2024. <sup>27</sup>	Meta-analysis of RCTs	Body weight, Body Mass Index, Waist Circumference	reductions in all with parameters with Green Tea Supplements
4	Xu Renfan et al 2020. <sup>20</sup>	Systematic Review with Meta-analysis	Lipids	Reduction in Triglycerides

#### B. Mental Health Effects

Beyond physical health, tea has definite positive effects on mental well-being of an individual. Research suggests that tea consumption enhances cognition and attention.<sup>28</sup>

L-theanine present in Tea has shown to improvise the day functioning in individuals, reduce their levels of anxiety and helps in mood elevation as well. These effects are attributed to regulation of neurotransmitters, reduced cortisol response, and anti-inflammatory actions of the active reagent.<sup>29</sup> Also, it acts in synergistic effect with caffeine and helps in stress relief.<sup>11</sup> Another complementing effect of tea on mental health of a person is its ability to improve the sleep quality, both in healthy individuals as well in clinical subjects.<sup>30</sup>

Table 2 summarizes the key research papers, systematic reviews and meta-analyses pertaining to the effects on tea on various mental health parameters.

Table 2: Representative Studies on Tea and Mental Health

S No	Citation	Study design	Outcome Measured	Key Finding
1	Jenkins G et al 2021 <sup>31</sup>	Systematic Review	Cognitive effect, Mental well being	Improves Human Cognition, Mental Wellbeing
2	Williams JL 2020 <sup>29</sup>	Systematic Review	Stress relief	Reduction of stress and anxiety in people exposed to stressful conditions
3	Saadatmand S 2024 <sup>32</sup>	Systematic Review	Anxiety reduction	Potential anxiolytic effect of Tea
4	Ouyang J 2022 <sup>30</sup>	Review	sleep	Potential of tea to harmonize sleep

### C. Occupational Health effects

Undoubtedly, Tea is one of the most widely consumed beverages in workplaces around the world. Tea consumption at workplace has multiple roles to play, which in overall certainly have a positive impact on the mental health of the employees thereby increasing work productivity at large.

The moderate caffeine content helps to improve alertness and attention, both of which are required especially in long working hours. It is a well-known fact that L-theanine promotes relaxation and also helps maintain as sustained focus, which, in overall help in maintaining concentration on work.<sup>11</sup>

Well defined tea breaks during work hours tea breaks provide an opportunity for a brief rest and refreshment of mind, thereby reducing the sense of fatigue. Also, Tea breaks at workplace promote team bonding amongst co-workers, a feature, the importance of which cannot be overlooked.<sup>33</sup> The culture of having Tea-clubs at workplaces and institutes are actually based on the foundation of promoting casual interactions amongst co-workers, faculty members and students, thereby easing out the work-related stress.

### D. Social, Community and Cultural effects

Tea is a powerful social and cultural medium that enhances community life. Tea drinking is a social ritual that promotes friendship and bonding in members of a society. The tea meetings at homes, in clubs, at social gatherings, cultural festivities etc are a ceremonial symbol which promote bonding at community level.

The casual meeting over tea many a times help to solve minor issues at family and social level and are considered as a highly reliable medium for conflict resolution and reinforcement of cultural identity. Tea gatherings have a central role to play in festivals, religious ceremonies, highlighting its role in cultural heritage and inter-generational exchange.<sup>7</sup>

As it promotes social interaction and the feeling of community belonging, tea consumption strengthens cultural identity and is definitely a significant medium to promote intercultural exchange in today's increasingly globalized world.

Tea drinking promotes respect, curiosity, and understanding across cultures by familiarizing the individuals to the customs and values of different societies. This makes tea a gentle yet powerful agent of intercultural exchange thereby promoting global cultural harmony.<sup>34</sup> The use of different types of tea from various regions across the globe at international events, symbolises the unity in social rituals despite cultural diversity.

### Limitations of Evidence and Research Gaps

Although there are several researches available which validate the significant contribution of tea consumption to different aspects of human life, there are certain limitations of the studies and the research gaps which need to be filled in times to come.

The majority of studies are only observational and not interventional, thus it would be inappropriate to mention that there can be a bias. Also most of the studies are short term and thus arises the need for long term ones, with larger population size covered. The difference in parameters such as temperature, brewing time, addition of ingredients as milk, honey etc are the parameters which at times are difficult to control, thereby creating research gaps. Risk of tea leaf contamination from excessive use of pesticide is another aspect which has been overlooked and needs deep analysis and a food for thought in terms of policy making.

Also, it is imperative to say that there is a lack of valid classification system for evaluation of effects of tea consumption on physical, mental, social and cultural health of humans, thereby necessitating the formulation of such classification systems for research purposes as well as for policy making

#### **Future Directions and Recommendations**

Future research should emphasize on a systematic evaluation of effects of tea consumption on overall quality of life of an individual by using specific indices and classification systems which can standardize the studies being done across the world.

Emphasis must be paid on evaluation of social health outcomes rather than focusing only on physical aspects. As part of occupational health promotion, use of tea may be encouraged as a healthier alternative to sugar-sweetened beverages at work places. Sociologists, clinicians, policy makers and all other stake holders must join hands to design multidisciplinary research, formulate evidence-based guidelines and create culturally sensitive strategies that maximize the health, social, and community benefits of tea.

#### **CONCLUSION**

Tea represents a unique combination of cultural tradition and scientific evidence. Moderate tea consumption is associated with improved physical health; **greater cognitive and emotional resilience** in terms of acting as stress and anxiety reliever along with beneficial effects on sleep; promotion of bonding at social and community level and strengthening of cultural traditions. Its contribution to both an individual and to the community is paramount. Systematic studies can further solidify its role in clinical and public health practice.

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