

## How does the weather impact the moods of teenagers?

### Introduction

Over the course of lockdown as well as school terms, it is no surprise that teenagers experience mood swings often due to factors such as stress, anxiety, hormones or fatigue, many of which are internal factors. In this investigation, we will collect and analyse data to answer the question, "How does the weather impact the moods of teenagers?". Weather is an external factor and preferences can differ from person to person based on personality or mindset, however scientific research has shown that weather does in fact affect one's mood.

The following investigation will test which types of weather are preferred by teenagers aged 13-15 and why these choices provoked feelings of happiness or sadness.

Five people in each age group (13,14 and 15 year olds) were asked to fill out a survey consisting of the following questions.

1. Which type of weather boosts your mood (makes you feel happier)?
2. For your choice, provide a reason why.
3. Which type of weather lowers your mood (makes you feel sad or down)?
4. For your choice, provide a reason why.

Options for weather that boosts or lowers moods include:

- Sunny
- Rainy
- Cloudy
- Stormy
- Partly cloudy

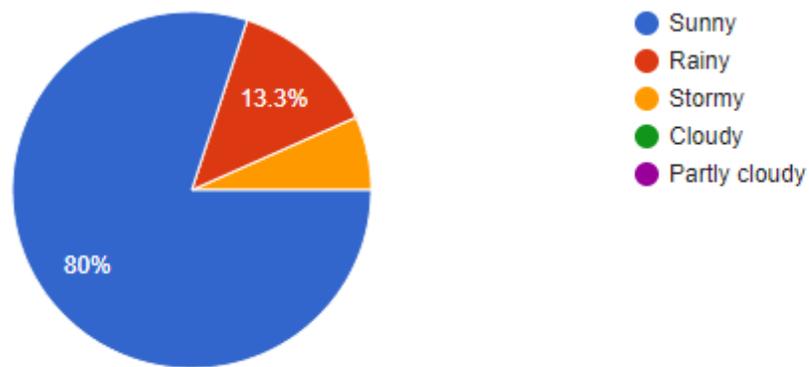
### Demographic Information

Mean age	15
Age range	13-15
Number of males	3
Number of females	12

The pi charts below represent the answers given.

## Which type of weather boosts your mood (makes you feel happier)?

15 responses



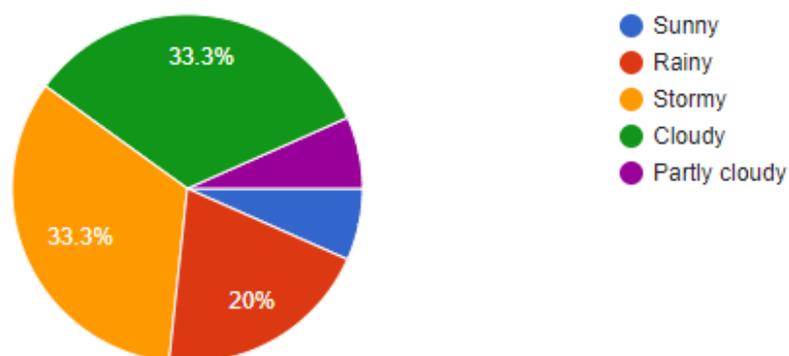
Evidently, sunny weather was the leading result for the favorite type of weather. Reasons for this include:

- It wakes you up
- Energises you for the day
- Provides a summer feeling
- You can go outside
- The warm weather and brightness is uplifting and motivating
- The sun provokes a feeling of excitement

The next most common answer was rainy, followed by stormy.

## Which type of weather lowers your mood (makes you feel sad or down)?

15 responses



The top two answers for the types of weather that lowers the moods of teenagers are cloudy and rainy. Reasons for this include:

### **Stormy**

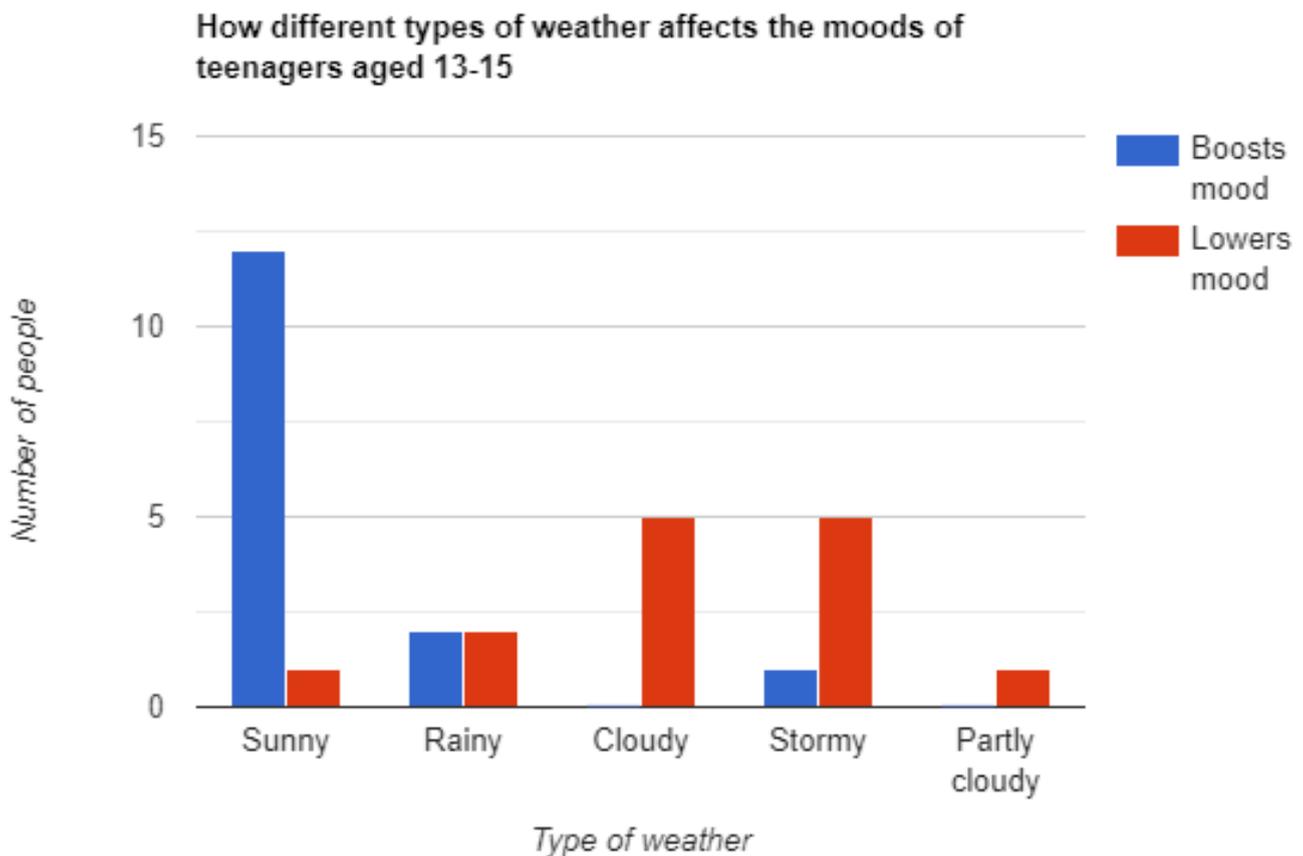
- The rain and thunder is loud
- You can't go outside
- Storms can be dangerous and have detrimental aftermath

### **Cloudy**

- The sky is dark and gloomy
- It is in between hot and cold
- It is dark
- The atmosphere is dull

The next most common answer was rainy, followed by partly cloudy and sunny.

The column graph below is a summary of the results received from the survey.



### Experimental Probability

Since  $\frac{12}{15}$  teens stated that sunny weather boosted their mood, the experimental probability that the next teenager asked would also favour sunny weather is  $\frac{4}{5}$  (80%).

$\frac{5}{15}$  teens stated that cloudy weather lowered their mood, meaning that the experimental probability that the next teen chooses cloudy weather is  $\frac{1}{3}$  (33.3%). This also applies for stormy weather, which received the same results.

### Additional data (external sources)

To further my collection of data, I have researched another survey asking adolescents a similar question, however the group asked was larger and provided a greater age range, resulting in a broader sample. This will assist me in constructing a more accurate conclusion for this investigation.

The following extracts are from a report called, ‘Weather preference and perceived weather effects amongst Chinese adolescents’ written by MYL Chiu, HT Wong and X Yang (<http://www.hkjpaed.org/pdf/2016;21;168-177.pdf>). By comparing my small sample with this larger one, it is possible to see how preferences may or may not be more varied, as well as the results these can have on the moods of teenagers. It will also assist in determining whether or not answers can change based on where the respondents are in the world.

- Age range: 11-21
- Mean age: 14.5

**Table 4** Participants' preferences and their perceived effects of different weather conditions on mood by gender

Weather condition	Gender	Preference				Perceived effects on mood*		
		Like	Dislike	Neutral	p-value	Marks	Mean difference	p-value
Fine	Male	859 (64.9)	114 (8.6)	351 (26.5)	0.00***	1.12 (1.56)	-0.172	0.01**
	Female	1460 (66.1)	107 (4.8)	642 (29.1)		1.30 (1.31)		
	Total	2319 (65.6)	221 (6.3)	993 (28.1)		1.23 (1.41)		
Cloudy	Male	680 (51.7)	256 (19.5)	380 (28.9)	0.00***	0.53 (1.57)	0.107	0.04*
	Female	1044 (47.3)	382 (17.3)	779 (35.3)		0.42 (1.38)		
	Total	1724 (49.0)	638 (18.1)	1159 (32.9)		0.46 (1.45)		
Light rain	Male	519 (39.5)	387 (29.5)	407 (31.0)	0.60	0.19 (1.46)	-0.025	0.62
	Female	871 (39.5)	621 (28.1)	715 (32.4)		0.21 (1.35)		
	Total	1390 (39.5)	1008 (28.6)	1122 (31.9)		0.20 (1.39)		
Heavy rain	Male	374 (28.4)	716 (54.3)	228 (17.3)	0.00***	-0.41 (1.92)	0.366	0.00***
	Female	451 (20.5)	1270 (57.6)	483 (21.9)		-0.78 (1.74)		
	Total	825 (23.4)	1986 (56.4)	711 (20.2)		-0.64 (1.82)		
Dry	Male	222 (16.9)	762 (57.9)	333 (25.3)	0.00***	-0.60 (1.57)	0.134	0.01*
	Female	237 (10.7)	1330 (60.3)	639 (29.0)		-0.74 (1.36)		
	Total	459 (13.0)	2092 (59.4)	972 (27.6)		-0.69 (1.44)		
Humid	Male	128 (9.7)	936 (70.7)	260 (19.6)	0.00***	-1.03 (1.51)	0.348	0.00***
	Female	62 (2.8)	1737 (78.8)	406 (18.4)		-1.38 (1.29)		
	Total	190 (5.4)	2673 (75.7)	666 (18.9)		-1.25 (1.38)		
Thunder-storms	Male	422 (32.0)	571 (43.3)	325 (24.7)	0.00***	-0.08 (1.74)	0.353	0.00***
	Female	517 (23.4)	1067 (48.4)	621 (28.2)		-0.44 (1.64)		
	Total	939 (26.7)	1638 (46.5)	946 (26.9)		-0.30 (1.69)		
Typhoon	Male	701 (53.0)	289 (21.8)	333 (25.2)	0.00***	0.70 (1.88)	0.363	0.00***
	Female	937 (42.4)	599 (27.1)	672 (30.4)		0.34 (1.79)		
	Total	1638 (46.4)	888 (25.1)	1005 (28.5)		0.48 (1.83)		
Hot	Male	97 (7.3)	954 (72.1)	272 (20.6)	0.00***	-1.12 (1.65)	0.427	0.00***
	Female	69 (3.1)	1778 (80.6)	359 (16.3)		-1.55 (1.38)		
	Total	166 (4.7)	2732 (77.4)	631 (17.9)		-1.39 (1.50)		
Cold	Male	471 (35.7)	416 (31.5)	432 (32.8)	0.00**	0.17 (1.78)	0.081	0.18
	Female	726 (32.9)	617 (28.0)	864 (39.1)		0.09 (1.63)		
	Total	1197 (33.9)	1033 (29.3)	1296 (36.8)		0.12 (1.69)		

(p-value: the probability of obtaining results at least as extreme as ones obtained from an investigation relating to a hypothesis)

Table 4 shows the weather preferences of teens and young adults as well as their perceived effects on their mood by gender. For the most part, respondents preferred good/stable weather rather than other poor/unstable weather, excluding typhoons and cold weather. Typhoons and cold weather were favoured by respondents with a particularly higher number of males preferring this type of weather than females. Considering my own survey only gained results from a handful of male respondents, this information is crucial in determining if or how weather impacts the moods of teenagers.

I have created a table to summarise the information into the number of people who like/dislike or are neutral for each type of weather. The total number of answers was also given as not all people gave answers (3552 were surveyed in total).

Type of Weather	Like	Dislike	Neutral	Total	Experimental probability that the next person chooses 'like' (%)
Fine	2319	221	993	3533	65.6
Cloudy	1724	638	1159	3521	49.0
Light rain	1390	1008	1122	3520	39.5
Heavy rain	825	1968	711	3504	23.4
Dry	459	2092	972	3523	13.0
Humid	190	2673	666	3529	5.4
Thunderstorms	939	1638	946	3523	26.7
Typhoon	1638	888	1005	3531	46.4
Hot	166	2732	631	3529	4.7
Cold	1197	1033	1296	3526	33.9

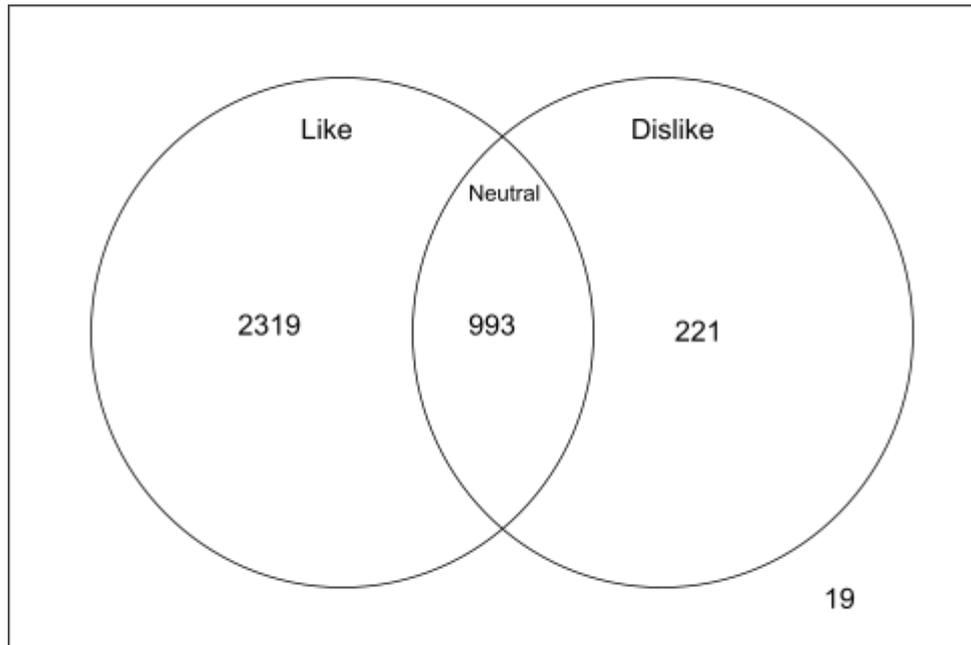
Table 7 portrays impacts unpreferred weather can have on the moods and attitudes of the adolescent respondents, many of which are similar to the reasons given by my own respondents. Preferred weather would obviously create the opposite effect that the impacts listed do.

**Table 7** Participants' perceived effects of unfavourite weather conditions by age and gender

No. Question	Gender <sup>†</sup>			Total	Age <sup>**</sup>	
	Male	Female	p-value		p	p-value
1 Want to be alone	542 (41.0)	974 (44.1)	0.07	1524 (42.9)	-0.12	0.00***
2 Feel lonely	425 (32.1)	694 (31.4)	0.63	1127 (31.7)	-0.09	0.00***
3 Do not want to have contact with others	428 (32.4)	729 (33.0)	0.73	1165 (32.8)	-0.13	0.00***
4 Difficult to get along with others	350 (26.6)	446 (20.2)	0.01***	799 (22.5)	-0.10	0.00***
5 Feel uncomfortable when getting along with others	434 (32.9)	653 (29.6)	0.04*	1090 (30.7)	-0.09	0.00***
6 Not easy to trust others	267 (20.2)	190 (8.6)	0.01***	458 (12.9)	-0.06	0.00**
7 Look tense	374 (28.5)	472 (21.4)	0.01***	850 (24.0)	-0.01	0.74
8 Do not want to communicate with others	416 (31.6)	637 (28.8)	0.08	1057 (29.8)	-0.09	0.00***
9 Afraid to get along with others	262 (19.8)	211 (9.6)	0.01***	474 (13.4)	-0.09	0.00***
10 Distrust of others	259 (19.6)	166 (7.5)	0.01***	426 (12.0)	-0.06	0.00**
11 To argue with others easily	430 (32.6)	790 (35.8)	0.05*	1225 (34.5)	-0.05	0.00**
12 Do not want to go out	850 (64.6)	1734 (78.6)	0.01***	2599 (73.4)	-0.05	0.01**
13 Do not want to work or study	762 (57.8)	1451 (65.7)	0.01***	2223 (62.7)	-0.05	0.00**
14 Lose patience	656 (49.8)	1239 (56.2)	0.01***	1902 (53.7)	-0.02	0.19
15 Feel get along with others become disharmonious	354 (26.9)	486 (22.1)	0.00**	842 (23.8)	-0.08	0.00***
16 Lose intention to study	658 (49.9)	1244 (56.4)	0.01***	1909 (53.9)	-0.07	0.00***
17 Not go to school	-	-	-	-	-	-
18 Do not want to go to school	808 (61.1)	1534 (69.5)	0.01***	2352 (66.3)	-0.05	0.01**
19 Affect your academic performance	601 (45.6)	895 (40.8)	0.01**	1505 (42.6)	-0.06	0.01**
20 Lack of motivation, do not want having outdoor activities	779 (59.2)	1596 (72.6)	0.01***	2385 (67.5)	-0.08	0.00***
21 Affect my relationships with family or friends	312 (23.8)	312 (14.2)	0.01***	624 (17.7)	-0.07	0.00***
22 Reluctant to talk with family or friends	321 (24.4)	439 (19.9)	0.00**	764 (21.6)	-0.08	0.00***
23 Affect my thinking, make me made a wrong decision	371 (28.1)	408 (18.5)	0.01***	781 (22.0)	-0.05	0.01**
24 Affect my thinking, more difficult to make decision	430 (32.6)	585 (26.6)	0.01***	1019 (28.8)	-0.02	0.23
25 Become anxious	508 (38.6)	941 (42.7)	0.02*	1453 (41.1)	0.00	0.99
26 Thinking negative	469 (35.5)	760 (34.5)	0.52	1232 (34.8)	-0.07	0.00***
27 To lose temper easily	507 (38.4)	1002 (45.5)	0.01***	1515 (42.7)	-0.02	0.21
28 Lose momentum when doing things	574 (43.5)	1044 (47.4)	0.02*	1624 (45.8)	-0.06	0.00***
29 Mentally tormented	405 (30.6)	527 (23.9)	0.01***	936 (26.4)	-0.06	0.01**
30 Emotion become negative	457 (34.6)	737 (33.4)	0.48	1199 (33.8)	-0.08	0.00***

\*p<0.05; \*\*p<0.01; \*\*\*p<0.001; †The values below are the number and percentage of respondents answered agree/strongly agree; \*\*1: strongly agree; 2: agree; 3: disagree; and 4: strongly disagree

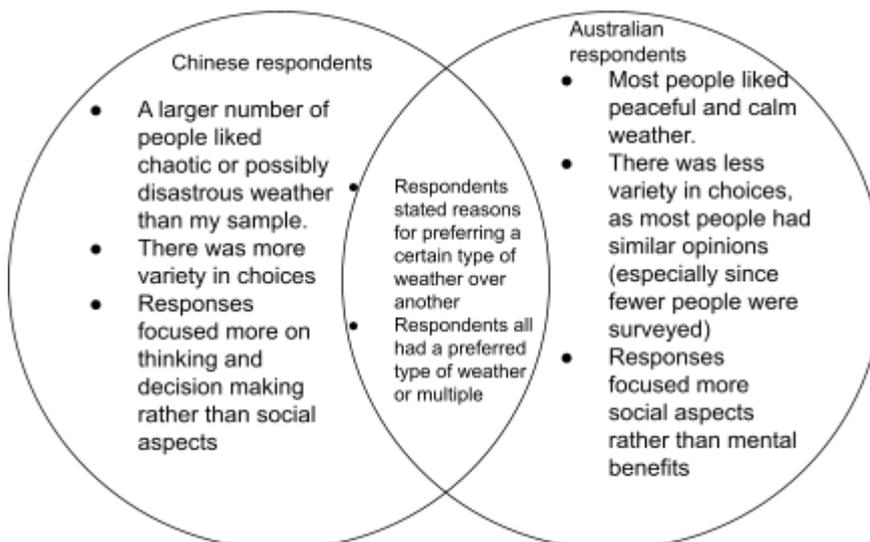
The Venn diagram represents the **number of people who like, dislike or are neutral about the most favoured type of weather, which was fine. I also included the number of people who did not provide an answer.**



### Analysis

After considering both my own and others' sets of data relating to the impact that preferred weather can have on the moods of teenagers and adolescents, it is evident that opinions about different types of weather vary widely. Although the majority of the respondents stated that they preferred sunny or stable weather because it energised them, woke them up for the day, motivated them, allowed them to think positively, etc, there were also other preferences. The second highest result of the Chinese adolescents for weather that makes them happiest was cloudy, with 1724 out of 3552 saying that they like it (although they were not limited to a single answer). 2 out of 15 people in my own survey said that rainy weather was their favourite type. Although the type of weather on a certain day does not impact all teenagers in the same way, it definitely impacts them in some way or another. When it is the preferred weather of a teenager, they will tend to be happier, more concentrated and cognitively switched on which may assist them in daily life, school tasks and sport related activities. It is also evident that the preferred weather choice is solely dependent on a person's personality, and whether they are more introverted or extroverted.

The Venn diagram below displays the main **similarities and differences between the responses of both surveys.**



## **Collaboration**

At the beginning of my investigation, I collaborated with my classmate Zara Cabot to discuss our ideas about gathering data. Although our investigations are on unrelated topics, we tried to find the most effective way to gather qualitative data and results. Considering both our investigations were based on opinionated data from children and adolescents, we decided that the best way to gather our own information was through sending out a google form to our families, friends and classmates in order to receive different perspectives from the target group. After gathering all of our first-hand data, we also decided together that pie graphs were the clearest way to display our information. This would help us to present our findings in an easy way to understand.

Furthermore, the assistance and collaboration of my classmates and family members through their responses to my survey allowed me to gather first-hand data, which I was then able to compare to data gathered by others.

## **Future Research**

- It would be more effective to go out and ask the public (aged 13-18) my question in the future. It would allow me to gather information on a broader range of people, perhaps with different personalities, backgrounds, living conditions and hobbies, all of which are factors that can affect their response.
- The response that stands out the most could assist schools in deciding when to have assessments or excursions. For example, if the majority of the form prefers sunny weather, this could increase their brain activity, attentiveness and their awareness of their surroundings on the day, however this would need to be tested in future investigations first. Although the weather is uncontrollable, even changing the conditions of the classroom such as the amount of natural light and the temperature of the classroom could increase feelings of happiness, resulting in better concentration. Considering sunlight causes an increase in the amount of serotonin (a hormone that boosts one's mood, calmness and focus) this theory is worth testing in the future.
- This philosophy could also apply to sporting organisations. Days or times for sports could be changed based on when children or teens are at their happiest and therefore most motivated state, however this would require lots of flexibility.
- These ideas could be tested through surveying amongst schools, sporting clubs and even people in public.
- Another way of testing this theory would be through analysing results of students tests during different times of the day. Did a student perform better when there was more natural daylight available, or when they relied on electrical lights? Do warmer classrooms provoke more rapid thinking, or cooler ones? These factors all vary due to weather types.

## **Conclusion**

Conclusively, the results from this investigation have varied with people of different genders, ages and personalities having different weather preferences, however there is no doubt that weather does have to do with the moods of teens. Although it is scientifically proven that sunny weather helps the brain release serotonin (leading to many other cognitive benefits), one's personal choice does have a greater impact on their mood. Whether their preference is sunny weather or stormy, their happiness is all dependent on their lifestyle choices and social activity.