

**Extroversion as a determinant in transportation mode choice**

**Ekstroversjon som en determinant innen transportvalg**

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**Preface**

It might not be typical to include a preface on a bachelor paper, but I would like to take the chance we were given by our course coordinator to say a little thank you to everyone that has helped me in the process of writing my thesis. First I'd like to thank everyone that has decided to answer my survey and send it further to other people. Without them the study could not be carried out. Secondly I'd like to thank my supervisor, Synne, for guiding me throughout the whole process and helping me write the best possible paper.

I would like to thank everyone that has been there for me on the way to writing and finishing my bachelor in psychology. They may not have had an impact on the process itself, but they have helped me keep my spirits up and carry on. I thank my mum, my dad, and my little brother Aleksander for supporting me through my entire journey those past three years and being a beacon of solace no matter what. I thank my grandma and grandpa for always finding a time to talk with me despite the thousands of kilometers between us. I thank my girlfriend, Ioana, for always reminding me not to worry too much, and for all the adventures we've had this semester despite both of us being occupied with our bachelor theses. I thank my childhood friends: Kuba, Konrad and Marcin for their friendship that has held on despite us living in different countries.

### **Abstract**

The Big Five personality inventory has been used in very few studies concerning modes of transportation. With climate change being a topic that is gaining traction with every passing year, governing bodies such as the EU are trying to move away from fossil fuels and achieve net neutrality. With the climate debate, as well as the lack of research in that particular field in mind I have developed a research question concerning how the Big Five personality trait of extroversion correlates with the use of different transportation modes. An anonymous online survey has been developed on Nettskjema.no in order to collect data for the study. 58 respondents (n=58) have taken part in the study with the use of a snowball convenience sampling process. IBM SPSS has been used for statistical analyses. A descriptive analysis, a reliability analysis, and correlation analysis have been run as a part of the study process. The extroversion variables had an alpha score of .771, while the introversion items had an alpha score of .681. In the end only one out of five extroversion variables had a significant positive correlation with car driving. In addition all three introversion variables had a significant negative correlation with car driving. Two out of five extroversion variables had a significant positive correlation with cycling. While the goals of the study have been achieved, it can be argued whether the results confirm the hypothesis or not.

*Keywords:* Big Five, Extroversion, Transportation

### **Abstract**

Big Five-inventaret har blitt brukt i veldig få studier om transportmåter. Med klimaendringer som et tema som får mer oppmerksomhet vil styrende organer som EU prøve å gå bort fra fossilt brensel og oppnå nettnøytralitet. Med klimadebatten, så vel som mangelen på forskning på det aktuelle feltet i tankene, har jeg utviklet et forskningsspørsmål rundt hvordan personlighetstrekket ekstroversjon fra Big Five personlighetsinventariet korrelerer med bruken av ulike transportmåter. En anonym nettundersøkelse har blitt utviklet på Nettskjema.no for å samle inn data til studien. 58 respondenter (n=58) har deltatt i studien med bruk av en snowball sampling prosess. IBM SPSS har blitt brukt til statistiske analyser. En deskriptiv analyse, en reliabilitetsanalyse og korrelasjonsanalyse har blitt gjort som en del av studieprosessen. Ekstrovesjons variabler hadde en alpha verdi på .771, mens introversjons variabler hadde en alpha verdi på .681. Til slutt hadde bare én av fem ekstroversjon variabler en betydelig positiv korrelasjon med bilkjøring. I tillegg hadde alle tre introversjon variablene en signifikant negativ korrelasjon med bilkjøring. To av fem ekstroversjon variabler hadde en

signifikant positiv korrelasjon med sykling. Mens målene for studien er nådd, kan det diskuteres om resultatene bekrefter hypotesen eller ikke.

*Nøkkelord:* Big Five, Ekstroversjon, Transport

**Contents**

<b>1.0: Introduction.....</b>	<b>6</b>
<b>2.0: Methods.....</b>	<b>9</b>
2.1: Ethical considerations.....	9
2.2: Methods used.....	9
2.3: Sample design and data collection.....	9
2.4: Variables, Measurements and Analytics.....	10
2.5: Procedure.....	11
<b>3.0: Results.....</b>	<b>14</b>
3.1: Characteristics of the sample.....	14
3.2: Reliability.....	21
3.3: Correlations between extroversion and transportation mode choices.....	21
<b>4.0: Discussion.....</b>	<b>29</b>
4.1: Limitations.....	31
<b>5.0: Conclusion.....</b>	<b>33</b>
<b>6.0: References.....</b>	<b>35</b>
<b>7.0: Appendix.....</b>	<b>37</b>

## **1.0: Introduction**

### **Background**

Climate change and the ongoing crisis connected to it are topics gaining more and more traction with every passing year. With much discussion surrounding the Earth's climate and the steps necessary to address it, I found it an interesting subject to root my thesis in. The European plan to slowly move away from fossil fuels and aim for climate neutrality by the year 2050 (European Commission, u.d), as well as the 2022 Emissions Gap Report (United Nations Environment Programme, 2022) can indicate that changes in how we travel might occur. It can therefore prove useful and applicable to try to find factors that are at play when determining the society's transportation habits and transport mode choices. Even though public transport alternatives are growing in popularity in many countries, the car remains the dominant transportation mode around the globe due to factors such as convenience or the economic symbolism that owning a car brings (Roos et al., 2020). In Norway the number of new cars being registered, as well as car travel in general are still on the rise, by 8,2% compared to the last 5 years and 3,8% compared to the last 10 years respectively (SSB, 2021). Furthermore, 91,6% of all personal transportation is happening on the roads (SSB, 2022). Comparing these numbers to public transportation statistics there is a clear preference for car use with a significant 10,8% decrease in public transport use compared to 10 years ago (SSB, 2021). It is however important to note that the Covid-19 pandemic could've had an impact on those statistics. Investigating the effects of personalities' influence on choice of transportation mode can prove interesting due to how personalities differ from person to person, how personality affects our lives, as well as the arguable lack of research that investigates correlations between transportation mode choices and personality.

### **Theory & Hypothesis**

The Five Factor Model, also known as the Big Five is the main theoretical background of this study. Personality as a predictor of behavior has been investigated in many studies, from determining if rude people drive expensive cars (Lönqvist, et al., 2020), determining behavior during the Covid-19 pandemic (Götz, et al., 2020), even going as far as to be used as a predictor of involvement in incel communities (Bieselt, 2020). There has however been a limited amount of studies concerning how personality can determine or correlate with transport mode choice (Yazdanpanah & Hosseinlou, 2017). Studies that have investigated

personality as a predictor of transportation mode choice have found contesting results. A study from Tehran, Iran by Yazdanpanah & Hosseinlou (2017) concerning personalities' role in determining future preferences in use of public transport has “concluded that use of public transportation is positively related to Extraversion”. A national study from Sweden by Ross et al. (2020) concerning effects of personality as a determining factor in transport mode choice has concluded that car driving is influenced by a high degree of extroversion, whereas public transport use is influenced by a low degree of extroversion. In contrast, a study from Sweden that focused only on the city of Gothenburg has found no effects similar to the national study when it comes to extroversion and its influence on either car driving or use of public transport (Roos et al., 2022). As such the hypothesis of this study is that a high level of extroversion among respondents will result in a higher likelihood of taking the car, whereas a low level of extroversion will result in a higher likelihood of choosing public transportation, due to the sample not being limited to just one city.

**Research question:**

1. How does extroversion correlate with the choice of transportation mode among people living in Norway?

The focus of this study will be the factor of extroversion from the Five Factor Model, and its correlations with transport mode choice. Extraversion according to the American Psychologists Association can be:

“characterized by an orientation of one’s interests and energies toward the outer world of people and things rather than the inner world of subjective experience. Extraversion is a broad personality trait and, like introversion, exists on a continuum of attitudes and behaviors. Extraverts are relatively outgoing, gregarious, sociable, and openly expressive.” (APA, n.d).

Introversion is the opposite of extraversion and is defined as the “orientation toward the internal private world of one’s self and one’s inner thoughts and feelings, rather than toward the outer world of people and things” (APA, n.d).

The reason for choosing extroversion above the other four factors is mainly the differing results that came from the studies that have investigated personality as a predictor of transportation choices. Another minor reason is that being labeled as an extrovert or an introvert has arguably become a part of the everyday dictionary for many. Typing the term

“extrovert in pop culture” will result in articles written by mainstream papers such as Time (Walsh, 2012), or The Guardian (Tucker, 2012).

In studies utilizing the Big Five inventory personality traits are measured with Likert scale questionnaires, ranging from 1 (Strongly agree) to 4 (Strongly disagree) for example. Big Five inventories can differ in the amount of items. The one used by Roos, et al. (2020) was a 10 item inventory. The study conducted by Yazdanpanah & Hosseinlou (2017) used a measurement that included 60 items.

The main goal of this study is to try to identify if personality, in this case extraversion, has a positive correlation with car driving and if introversion has a positive correlation with public transport use. The secondary goal is to try to get an idea of the population’s transportation habits.



## **2.0: Method**

### **2.1: Ethical considerations**

Before answering the online survey, participants were asked to confirm that they are at least 18 years of age and that they consent to partake in the study. Participation was voluntary, and the participants gave informed consent in accordance with the declaration of Helsinki. To ensure total anonymity, age, gender or the place of residence were not investigated in the study. Nettskjema.no service was used in order to make sure that participants' IP addresses could not be tracked.

### **2.2: Methods used**

The study utilizes quantitative research method in the form of an anonymous self-report online survey in an effort to try to capture an individual's transportation choices. In addition to the transportation choices, there has been an effort to investigate participants' own evaluation of extraversion level. The design of this study is cross-sectional. A cross-sectional study design allows for people of different ages to be studied at only one point in time. With such a design one can make conclusions based on the results gathered in that one point in time, thus being well suited to shorter studies or studies where many different cohorts are to be investigated at the same time (Cozby & Bates, 2020).

### **2.3: Sample design and data collection**

The data in this study was collected using Nettskjema.no, an anonymous survey service. The survey consists of 21 items. 2 formality items that make sure the participant consents to take part in the study, 5 of which focus on the participants' ability to use different modes of transportation, 3 items focus on geography, 8 items that measure the participants' level of extraversion, and 3 items asking on the participants' frequency of use of different modes of transportation.

In total 58 participants (N=58) answered the survey. 31 of the participants lived in a bigger town or city, 17 lived in a small town, and 10 lived in a rural area by the time of answering the survey. Age or gender of the participants have not been investigated in this study. A convenience sampling in the form of a snowball design was used in this study where each of the initial respondents was asked to send the link further to 1-5 other people if possible. This

was done to simplify the data collection process, due to both the scale and the deadline of this thesis being rather close to the beginning of the semester. Choosing this sampling design has its flaws however, such as the validity of the study suffering, something that will be expanded on further in the limitations section of this paper.

#### **2.4: Variables, Measurements and Analytics (instrument & variables)**

The formality questions checked whether the participant is at least 18 years of age and whether they consent. Both questions only “yes” or “no” as answers and they will not be included in the analysis.

The questions concerning the participants ability to travel using different transportation methods were a “yes” or “no” question asking the participant if they have a car license, a question whether the participant has a license for any other vehicle in which the participant could choose among all the types of licenses available in Norway, and three questions concerning if the participant has a car, any other type of vehicle, or a bicycle available for daily use. The goal of these questions was to eliminate potential covariate variables where the non-availability of a car would be the deciding factor instead of the level of extroversion.

The questions concerning the geographical variables measured in what area the participant resides in a rural area (coded as 1), a small town with less than 50.000 inhabitants (coded as 2), or a big town or city with more than 50.000 inhabitants (coded as 3), how far the participant travels daily (less than 10 km, 11 - 50 km, 51 - 150 km, more than 150 km), and whether the participant commutes to a different municipality on the daily (yes, no). These questions were supposed to help to get an idea of the participants’ needs when it comes to transportation.

The 8 items used to assess the level of extroversion have been recreated from John’s & Srivastava’s (1999) 44-item Big Five inventory. The items were formed as statements about one’s level of different characteristics connected to extroversion. All items were measured in 5 point Likert scale (Strongly agree, Agree, Neither agree nor disagree, Disagree, Strongly Disagree). The items were as follows: “I am a talkative person”, “I am a reserved question” (reversed), “I am full of energy”, “I generate a lot of enthusiasm around me”, “I tend to be quiet” (reversed), “I have an assertive personality”, “I am shy and inhibited at times” (reversed), “I am outgoing and sociable”.

Car driving was measured with the following question: “How often have you driven a car during the last twelve months?”. “How often have you used public transportation during the

last twelve months?” measured the use of public transportation and “How often have you cycled during the last twelve months?” measured cycling frequency. All three questions had 7 alternatives: Several times a week (coded as 1), Occasionally every week (coded as 2), Occasionally every month (coded as 3), Occasionally during the past 3 months (coded as 4), Occasionally during the past 6 months (coded as 5), Occasionally during the past 12 months (coded as 6), Never (coded as 7). The participants were informed that in the context of the survey occasionally means on and off.

The survey has been placed in the Appendix at the bottom of the paper in the form of screenshots.

## **2.5: Procedure**

Firstly the 21 item survey was created on Nettskjema.no. The first two questions were created with participant’s consent in mind. Question number one was as follows: “Are you at least 18 years old?” The alternatives were “yes” or “no”. Answering “no” would not let the participant see any other questions. The second question was “Do you confirm and consent to participating in this survey about the effects of extroversion on transportation choice?”. The alternatives were “yes” or “no”. Answering “no” would not let the participant see any other questions in the survey. After consenting and confirming the participant could proceed to answer the rest of the survey.

The next part would present the respondent with the headline reading “The following part of the survey includes questions about participant's ability to use different transport modes”. The first question of this part was “Do you have a car license (B class license)” The answer alternatives were “yes” and “no”. The following question was “Do you have a driver’s license for any other vehicle?”. This question had several answer alternatives that could be chosen at the same time. The alternatives were: “no”, “moped license (AM)”, lightweight motorcycle license (A1)”, “medium weight motorcycle license (A2)”, “heavyweight motorcycle license (A)”, “three- or four wheeled motorcycle license (B1)”, “light truck / lorry license (C1)”, “truck / lorry license ( C)”, “minibus license (D1)”, “bus license (D)”, “tractor license (T)”, “other license (BE, C1E, CE, D1E, DE, S)”. This item was not included in the final analysis due to issues with analyzing the multiple choice items and the question being deemed not necessary. The next question was “Do you have a car available for daily use?” with “yes” and “no” as the answer alternatives. “Do you have any other vehicles available for daily use? If yes, what vehicle(s)?” was the next question. The participant had to write the

answer in the text box themselves. This created issues with the analysis, and for this reason, as well as being deemed unnecessary the item wasn't included. The next item in the survey was "Do you have a bicycle available for daily use?" with "yes" and "no" as the answer alternatives. "What type of area do you live in?" was the next item. The three answer alternatives were "rural area / village", "small town (below 50.000 inhabitants) e.g Sola, Tromsø, Molde, etc", "bigger town / city (above 50.000 inhabitants) e.g Sandnes, Stavanger, Bergen, etc.". The next item asked the participant "How far do you have to travel every day?". The answer alternatives were "less than 10km", "11-50 km", "51- 150 km", "more than 150 km". The last question in this part of the questionnaire was "Do you have to travel to a different municipality (kommune) for school, work, etc?" The answer alternatives were "yes" and "no".

The penultimate part of the survey had the following headline: "The following part of the survey includes statements about participant's level of extraversion." The statements were: "I am a talkative person", "I am a reserved person", "I am full of energy", "I generate a lot of enthusiasm around me", "I tend to be quiet", "I have an assertive personality", "I am shy and inhibited at times", "I am outgoing and sociable". All the eight statements had the same five answer alternatives. The alternatives were: "strongly agree", "agree", "neither agree nor disagree", "disagree", "strongly disagree".

The last part of the survey began with the following headline: "The following part of the survey includes questions about participant's transportation habits." The questions were: "How often have you driven a car during the last twelve months ?", "How often have you used public transportation during the last twelve months ?", "How often have you cycled during the last twelve months ?". All three questions had the same seven answer alternatives. The alternatives were: "never", "occasionally during the past 12 months", "occasionally during the past 6 months", "occasionally during the past 3 months", "occasionally every month", "occasionally every week", "several times a week".

Upon delivering the survey the participant would be met with a "Thank you for participating in my survey!" message.

After being greenlit by the supervisor, the survey was sent to my colleagues from class, family members, friends and acquaintances from different parts of the country. Each of them was asked to send the survey further to their friend and acquaintance circles if possible in order to gain as many respondents as possible thus creating a snowball effect. The survey was

closed in the second week of March roughly seven weeks before the thesis was due to be delivered. In the end 58 people answered the survey.

IBM SPSS was used for analyzing the data gathered in the survey. Due to problems with running, analyzing, coding or transferring the data into SPSS everything was filled in manually in the Variable View of the program. All analyses seem to have worked fine thereafter. Firstly a descriptive analysis was run in order to access all the numbers of answers and percentages of answers chosen. This also helped confirm that everything was filled in correctly by checking the data with the answers on Nettskjema.no.

Second analysis was reliability analysis. The analysis resulted in a low reliability scoring due to a mistakable choice of running all the variables at the same time. The variables do not necessarily measure the same thing, thus giving a potentially lower reliability scoring. After being reminded of this fact by the supervisor, another reliability analysis was run. This time the 5 extraversion variables: talkativeness, being full of energy, generating a lot of enthusiasm around oneself, having an assertive personality and being outgoing and sociable were run on their own. This resulted in a reliability score of .771. The reversed extroversion variables, also called introversion variables (being reserved, tending to be quiet, being shy and inhibited at times) were run on their own in a different reliability analysis. This resulted in a reliability score of .681.

The third analysis that was done in this study was correlation analysis. This was done by running each of the transportation mode variables (car driving during the past year, public transport use during the past year, cycling during the past year) with the 5 extroversion variables at first, and then with the 3 introversion variables the second time.

After some feedback from my supervisor I was recommended to turn the three introversion variables into one variable by using the Compute Variable function of SPSS. This was done by calculating the mean of the variables in order to create a new variable simply called "Introversion\_68". The 68 comes from the .681 reliability score. A new correlation analysis was run with the new introversion variables and the three different transportation modes.

### 3.0: Results

#### 3.1: Characteristics of the sample

81% of the 58 participants had a car license at the time of answering the Survey, and 63.8% of all the participants had at least one car available for daily use. 39.7% of respondents had a bicycle available for daily use.

**Table 1**

Ability to travel  
by car or  
bicycle

	Car license		Car available		Bicycle available	
	n	%	n	%	n	%
Yes	47	81	37	63.8	23	39.7
No	11	19	21	36.2	35	60.3

17.2% of the respondents lived in a rural area, 29.3% lived in a small town with a population below 50.000, and the majority of 53.4% lived in a bigger town or city with more than 50.000 inhabitants. This shows that over half of the respondents should have access to good public transportation alternatives.

56.9% of the respondents have less than 10 km of travel to work, school, etc. each day. 39.7% of the participants have between 11 and 50 km of travel each day. 3.4% participants have to travel between 51 and 150 km daily, and none of the respondents have reported to travel over 150 km daily.

53.4% of the respondents do not travel to a different municipality for work, school, etc. every day.

**Table 2**

Residence & Travel

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**Area of residence**

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	n	%
Rural area	10	17.2
Small town	17	29.3
Big town or city	31	53.4

**Daily travel**

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	n	%
Less than 10 km	33	56.9
11 – 50 km	23	39.7
51 – 150 km	2	3.4

**Travel to different municipality**

	n	%
Yes	27	46.6
No	31	53.4

To the “I am a talkative person” statement: 8.6% of the participants agreed strongly, 46.6% agreed, 27.6% neither agreed nor disagreed, and 17.2% disagreed.

To the “I am a reserved person” statement: 5.2% of the participants agreed strongly, 48.3% agreed, 31% neither agreed nor disagreed, 13.8% disagreed, and 1.7% of the participants disagreed strongly.

To the “I am full of energy” statement: 5.2% of respondents strongly agreed, 34.5% agreed, 39.7% neither agreed nor disagreed, 19% disagreed, and 1.7% of the participants strongly disagreed.

To the “I generate a lot of enthusiasm around me” statement: 5.2% strongly agreed, 36.2% agreed, 46.6% neither agreed nor disagreed, 10.3% disagreed, and 1.7% strongly disagreed.

To the “I tend to be quiet” statement: 13.8% of the people agreed strongly, 34.5% agreed, 24.1% neither agreed nor disagreed, and 27.6% disagreed.

To the “I have an assertive personality” statement: 10.3% of the participants strongly agreed, 20.7% agreed, 44.8% neither agreed nor disagreed, 17.2% disagreed, and 6.9% strongly disagreed.

To the “I am shy and inhibited at times” statement: 6.9% of the respondents agreed strongly, 53.4% agreed, 17.2% neither agreed nor disagreed, 15.5% disagreed, 6.9% strongly disagreed.

To the “I am outgoing and sociable” statement: 12.1% of the people strongly agreed, 39.7% agreed, 25.9% neither agreed nor disagreed, 19% disagreed, and 3.4% strongly disagreed.



**Table 3**

Extroversion levels	Talkative		Reserved		Full of energy		Generates enthusiasm	
	n	%	n	%	n	%	n	%
Strongly agree	5	8.6	3	5.2	3	5.2	3	5.2
Agree	27	46.6	28	48.3	20	34.5	21	36.2
Neither agree nor disagree	16	27.6	18	31	23	39.7	27	46.6
Disagree	10	17.2	8	13.8	11	19	6	10.3
Strongly disagree	-	-	1	1.7	1	1.7	1	1.7
	Quiet		Assertive personality		Shy & Inhibited		Outgoing & Sociable	
	n	%	n	%	n	%	n	%
Strongly agree	8	13.8	6	10.3	4	6.9	7	12.1
Agree	20	34.5	12	20.7	31	53.4	23	39.7

Neither agree nor disagree	14	24.1	26	44.8	10	17.2	15	25.9
Disagree	16	27.6	10	17.2	9	15.5	11	19
Strongly disagree	-	-	4	6.9	4	6.9	2	3.4

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On the car driving measure: 37.9% of the respondents answered that they drive a car several times a week, 22.4% drive occasionally every week, 3.4% drive occasionally every month, 10.3% drove on and off during the past 3 months, 8.6% drove occasionally during the past 6 months, 6.9% drove occasionally during the past year, and 10.3% never drove in the last year.

**Table 4**

Car driving during last year

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	n	%
Several times a week	22	37.9
Occasionally every week	13	22.4
Occasionally every month	2	3.4
Occasionally during the past 3 months	6	10.3

Occasionally during the past 6 months	5	8.6
Occasionally during the past 12 months	4	6.9
Never	6	10.3

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On the use of public transport: 29.3% of the people reported to take public transport several times a week, 15.5% take public transport occasionally every week, 15.5% take public transport on and off every month, 10.3% took public transport occasionally during the past 3 months, 1.7% used public transport occasionally during the past 6 months, 19% took public transportation occasionally during the past year, and 8.6% have not used public transport during the past year.

**Table 5**

Using of public transport during the past year

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	n	%
Several times a week	17	29.3
Occasionally every week	9	15.5
Occasionally every month	9	15.5
Occasionally during the past 3 months	6	10.3

Occasionally during the past 6 months	1	1.7
Occasionally during the past 12 months	11	19
Never	5	8.6

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On the bicycle use measure: 8.6% reported to cycle several times a week, 3.4% cycle occasionally every week, 3.4% cycle on and off every month, 0% of the respondents reported to occasionally cycle during the past 3 months, 8.6% cycled occasionally during the past half a year, 15.5% cycled occasionally during the past 12 months, 60.3% have not cycled in the span of the past year.

**Table 6**

Cycling during the past year

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	n	%
Several times a week	5	8.6
Occasionally every week	2	3.4
Occasionally every month	2	3.4
Occasionally during the past 3 months	-	-

Occasionally during the past 6 months	5	8.6
Occasionally during the past 12 months	9	15.5
Never	35	60.3

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### 3.2: Reliability

Two reliability analyses were run for the items measuring extroversion. The first analysis included the following variables: Talkative, Full of energy, Generates enthusiasm, Assertive personality, and Outgoing & sociable. The Cronbach's  $\alpha$  on standardized items came out to a .771, which can be interpreted as a good reliability score. The second analysis included the reversed items with the following variables: Reserved, Quiet, and Shy & inhibited.

Cronbach's  $\alpha$  on standardized items showed a .681. SPSS suggests that if the Shy & inhibited variable were to be deleted, reliability would increase to a .762. The possible reason for that will be brought up in the discussion.

An alpha value above .70 is considered to be acceptable by the standard of many (Cortina, 1993). As such I think that the .771 and .681 reliability scores are sufficient for this study.

### 3.3: Correlations between extroversion and transportation mode choices

Six different correlation analyses were initially run in order to find out if there were any correlations between extroversion and the use of different transportation modes. Three analyses using the five variables that measure extroversion on a positive level i.e: talkativeness, being full of energy, generating a lot of enthusiasm around oneself, having an assertive personality, as well as being outgoing and sociable. Those five variables were run with each transportation mode measure.

Correlation analysis of the variables with car driving during the past year has shown a significant correlation at the 0.05 level (2-tailed) between car driving and being outgoing and sociable. The Pearson correlation between the variables was .294. The correlation between talkativeness and car driving was .016. The correlation between being full of energy and car driving was -.010. The correlation between generating a lot of enthusiasm around oneself and

car driving was -.048. The correlation between having an assertive personality and car driving was -.012.

**Table 7**

Pearson  
Correlations

	Talkative	Full of energy	Generates enthusiasm	Assertive personality	Outgoing & sociable	Car driving past year
Talkative	1	<b>.541**</b>	<b>.474**</b>	.195	<b>.569**</b>	.016
Full of energy	<b>.541**</b>	1	<b>.490**</b>	<b>.263*</b>	<b>.462**</b>	-.010
Generates enthusiasm	<b>.474**</b>	<b>.490**</b>	1	<b>.274*</b>	<b>.437**</b>	-.048
Assertive personality	.195	<b>.263*</b>	<b>.274*</b>	1	<b>.321*</b>	-.012
Outgoing & sociable	<b>.569**</b>	<b>.462**</b>	<b>.437**</b>	<b>.321*</b>	1	<b>.294*</b>
Car driving past year	.016	-.010	-.048	-.012	<b>.294*</b>	1

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed).

There was no significant correlation between extraversion and public transport use. The correlation between talkativeness and taking public transport was .152. The correlation between being full of energy and public transport use was -.009. The correlation between generating a lot of enthusiasm around oneself and the use of public transport was .081. The

correlation between having an assertive personality and public transport use was -.054. Being outgoing and sociable had a -.001 correlation with the use of public transport.

**Table 8**

Pearson  
Correlations

	Talkative	Full of energy	Generates enthusiasm	Assertive personality	Outgoing & sociable	Public transport use past year
Talkative	1	<b>.541**</b>	<b>.474**</b>	.195	<b>.569**</b>	.152
Full of energy	<b>.541**</b>	1	<b>.490**</b>	<b>.263*</b>	<b>.462**</b>	-.009
Generates enthusiasm	<b>.474**</b>	<b>.490**</b>	1	<b>.274*</b>	<b>.437**</b>	.081
Assertive personality	.195	<b>.263*</b>	<b>.274*</b>	1	.321*	.054
Outgoing & sociable	<b>.569**</b>	<b>.462**</b>	<b>.437**</b>	<b>.321*</b>	1	-.001
Public transport use past year	.152	-.009	.081	.054	-.001	1

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed).

Cycling had two significant correlations at the 0.05 level (2-tailed). The first correlation between cycling and being talkative has shown a .275 Pearson correlation. The second significant correlation was between cycling and being full of energy. The Pearson correlation between those variables was .288. The correlation between cycling and generating a lot of enthusiasm around oneself was -.022. The correlation between having an assertive personality and cycling was -.017. Being outgoing and sociable had a -.004 correlation with cycling.

**Table 9**

Pearson  
Correlations

	Talkative	Full of energy	Generates enthusiasm	Assertive personality	Outgoing & sociable	Cycling past year
Talkative	1	<b>.541**</b>	<b>.474**</b>	.195	<b>.569**</b>	<b>.275*</b>
Full of energy	<b>.541**</b>	1	<b>.490**</b>	<b>.263*</b>	<b>.462**</b>	<b>.288*</b>
Generates enthusiasm	<b>.474**</b>	<b>.490**</b>	1	<b>.274*</b>	<b>.437**</b>	-.022
Assertive personality	.195	<b>.263*</b>	<b>.274*</b>	1	<b>.321*</b>	-.017
Outgoing & sociable	<b>.569**</b>	<b>.462**</b>	<b>.437**</b>	<b>.321*</b>	1	-.004
Cycling past year	<b>.275*</b>	<b>.288*</b>	-.022	-.017	-.004	1

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed).



The other three analyses were run with the three reversed variables that measured extroversion on a negative level. The variables were: being reserved, tending to be quiet and being shy and inhibited at times. For the sake of the analysis these variables will be called introversion in this part of the paper. These were again run with each of the transportation mode variables.

Correlation analysis between the introversion variables and car driving during the past year has shown significant negative correlations at 0.05 level (2-tailed) on all three introversion factors. Being reserved had a -.298 correlation, a tendency to be quiet had a -.292 correlation, and being shy and inhibited at times had a -.280 correlation with car driving behavior.

**Table 10**

Pearson  
Correlations

	Reserved	Quiet	Shy & inhibited	Car driving past year
Reserved	1	<b>.626**</b>	<b>.327*</b>	<b>-.298*</b>
Quiet	<b>.626**</b>	1	<b>.295*</b>	<b>-.292*</b>
Shy & inhibited	<b>.327*</b>	<b>.295*</b>	1	<b>-.280*</b>
Car driving past year	<b>-.298*</b>	<b>-.292*</b>	<b>-.280*</b>	1

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed).

Using public transport had no significant correlation with introversion. Being reserved had a .052 correlation, a tendency to be quiet had a -.030 correlation, and being shy and inhibited at times had a -.009 correlation with public transport use.

**Table 11**

Pearson  
Correlations

	Reserved	Quiet	Shy & inhibited	Public transport use past year
Reserved	1	<b>.626**</b>	<b>.327*</b>	.052
Quiet	<b>.626**</b>	1	<b>.295*</b>	-.030
Shy & inhibited	<b>.327*</b>	<b>.295*</b>	1	-.009
Public transport use past year	.052	-.030	-.009	1

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed).

Cycling also did not have any significant correlations with introversion. Being reserved had a .003 correlation, a tendency to be quiet had a .165 correlation, and being shy and inhibited at times had a .384 correlation with cycling.

**Table 12**

Pearson  
Correlations

	Reserved	Quiet	Shy & inhibited	Cycling past year
Reserved	1	<b>.626**</b>	<b>.327*</b>	.003
Quiet	<b>.626**</b>	1	<b>.295*</b>	.165
Shy & inhibited	<b>.327*</b>	<b>.295*</b>	1	.117
Cycling past year	.003	.165	.117	1

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed).

After some feedback from my supervisor I was recommended to create a new variable by computing the mean of the three introversion variables in order to then correlate it with the different transportations modes. This process will perhaps yield better results due to the three variables possibly being too unreliable on their own. The correlations were as follows:

Introversion had a significant negative correlation with car driving,  $-.372$  Pearson correlation that was significant at the 0.01 level (2-tailed).

**Table 13**

Pearson Correlations

	Introversion	Car driving past year
Car driving past year	<b>-.372**</b>	1
Introversion	1	<b>-.372**</b>

\*\* . Correlation is significant at the 0.01 level (2-tailed).

Introversion had a nonsignificant positive Pearson correlation of .002 with public transport use.

**Table 14**

Pearson Correlations

	Introversion	Public transport use past year
Public transport use past year	.002	1
Introversion	1	.002

Introversion had a nonsignificant positive Pearson correlation of .129 with cycling.

**Table 15**

Pearson Correlations

	Introversion	Cycling past year
Cycling past year	.129	1
Introversion	1	.129

#### 4.0: Discussion

Some of the survey answers have been surprising. 47 of the 58 participants had a driver's license at the time of answering the survey, and 37 had a car available for daily use. This shows that over half of the participants have the ability to travel with a car on the daily. Over 50% of the respondents lived in a bigger town or a city by the time of responding to the survey. Over half of the respondents also reported to have less than 10 kilometers of travel or commute every day, this should have been an indication that the population might be more inclined to take public transportation despite a higher level of extroversion. However, still over half of the respondents have reported to drive a car either several times a week or occasionally every week. It can be argued that the majority of the respondents driving the car most frequently are the ones who have bigger distances to cover every day or live in smaller towns or rural areas, however the statistics do imply that cars are used by people no matter the place of residence or distance traveled.

There are several possible explanations as to why 11 of the participants did not have a driver's license at the time of answering the survey, but only 5 of the participants reporting to not have driven a car in the span of the last 12 months. This could be attributed to a participant losing their license or being a student driver with only a permit allowing them to drive with an experienced driver, instead of an actual license.

Some statistics from the results do not show as 100% if the values are added. On the "car driving past year" and "cycling past year" variables the percentages sum up to 99.8%. On the "area of residence", "assertive personality", "shy and inhibited", and "public transport use past year" variables the percentages sum up to 99.9%. On the "full of energy" and "outgoing and sociable" variables the percentages sum up to 100.1%. After checking all the tables between SPSS and the ones made by me I came to the conclusion that the values are the same on both. The most logical explanation for those values is SPSS only showing one number after the comma. There could be a long string of numbers after the comma that is simply rounded up to the closest number, thus creating sums that either do not add up to or exceed 100%.

The reliability of the study should be a point of discussion. A reliability score of .771 on the extroversion variables can be interpreted as acceptable, however with only five variables it is unsure how the coefficient alpha would be affected if more extroversion variables were added. The risk of the variables describing the same thing and thus cluttering the statistics is

real, however the potential of the opposite is also a possibility. I therefore deem the five variables with a reliability score of .771 to be satisfactory for this paper.

The same can however not be said about the .681 alpha score for the three introversion variables. The alpha could be increased to .762 if the “shy & inhibited” variable was deleted. This would however leave the analysis with only two variables, which is not enough to say anything about the real reliability of the introversion variables in my opinion. It could perhaps be better to add at least two more introversion variables in order to have five variables on extraversion and introversion. This way the alpha scores could be compared and more room for interpretation would open. The low alpha score of the introversion variables was probably the main reason for creating the new introversion variable, something that has proven to be a good choice. The correlation of  $-.372$  on the introversion variable is higher than any of the three variables on their own.

It seems that the hypothesis has been confirmed in a very slight way at the very least. With one variable connected to a higher level of extroversion having a significant positive correlation with car driving, as well as all three variables connected to a lower level of extroversion i.e introversion having a negative correlation with car driving. The newly created introversion variable also had a significant negative correlation with car driving. No significant correlations have been discovered between extroversion or introversion and the use of public transportation. This can imply that social and outgoing people tend to choose cars as their preferred mode of transportation significantly more often. It also implies that people who tend to be quiet, are reserved, and are shy and inhibited at times drive cars more seldom. Thus the part of the hypothesis theorizing that people having a higher level of extraversion are more likely to take the car is supported by a sole variable with a significant correlation. It might not be much, but perhaps it might be a point of reference for future studies. Perhaps the future hypothesis should be that outgoing and social people are more likely to drive cars more often than introverts?

Many possible factors can be taken into account in the results of this study. Everything from the sampling process, the methodology, the sample itself, or even the car simply being the most convenient transportation mode for many.

Have the goals of the study been achieved? The main goal of this study was to try to identify if extraversion has a positive correlation with car driving and if introversion has a positive

correlation with public transport use. I think that the goal has been achieved. The results point to a very slight correlation between being sociable and outgoing and car driving, as well as a slight negative correlation between introversion and car driving. It can be argued whether the results are valid, but the correlations have at the very least been identified and can potentially be used for future and improved studies.

The secondary goal is to try to get an idea of the population's transportation habits. The study has succeeded in helping me understand the transportation habits of the participants.

#### **4.1: Limitations**

In hindsight there are many things that could've been improved in both the survey design and the design of the study itself. The survey should have had a longer introduction with a part that let the participant get a better idea of what the study wants to investigate, as well as a longer informed consent form that ensured the participant of the total anonymity. This would have the added effect of making the survey seem more professional and well put together.

The survey should have at least included an item about the gender and the age of the participant. These variables were not initially included due to me misunderstanding how much information could be collected without having to send an application to the Norwegian Center for Research Data (NSD).

The study being based off of a self rapport survey could also have an effect on the results, as well as the study's validity.

Writing the thesis alone also proved to come with its setbacks in the form of having no one to discuss the methods, results or the writing process with. All the possible mistakes had to be evened out with the help of limited office hours with my mentor, thus leaving room for error in the study.

The convenience sampling process in the form of a snowball sample isn't ideal for future research, due to it potentially creating an unconscious bias of whom I included in the survey. However it was good enough for a simple bachelor thesis. Different sampling methods should however be taken into consideration for studies that wish to achieve better results.

I think the study's lack of validity is its biggest flaw. It cannot be said whether the results are representative for the population of interest. This is mainly due to the population of interest not being defined beyond people living in Norway. Including the age, gender, and perhaps the

county of residence would greatly improve the validity of the study. This could help investigate how different people answer the survey. These three variables would be the first changes I would do in order to improve the study next time around.

The use of English as the language of the survey was a conscious choice. The thought behind the choice was that the questionnaire could have been answered by more people, due to the fact that not everyone living in Norway understands Norwegian. It can be argued that this choice is a limitation, due to the use of some complicated expressions in the survey that some people could not understand. As well as some people being more comfortable with Norwegian rather than English.

The questions and the statements in the survey could have also been somewhat improved. The questions asking the participants how often they take different types of transportation modes could have benefited from reformulated answer alternatives. The word “occasionally” can be interpreted in many ways. Although there has been a clarification that in the context of the survey it means “on and off”, I believe that the question and the answer alternatives could still be confusing to some. Despite the Big Five statements being taken from a standardized form by John & Srivastava (1999), the statement of “I am shy and inhibited at times” could be changed or reformulated in my opinion. This is due to the argument that almost everyone can be shy and inhibited at some time or another. The placement of the statements could perhaps also be changed. The “I am a talkative person” and “I am a reserved person” statements coming one after another can potentially cause some misunderstanding or confusion for the respondents. Again it can be argued that one can be both talkative and reserved at the same time, this being reflected with almost the same amount of people agreeing with both statements.



## 5.0: Conclusion

With the introduction of new plans and ideas to slowly move away from fossil fuels in order to preserve our planet we can benefit from investigating and understanding the way we travel. Investigating factors that are at play when we travel could help bring positive change for our climate, city planning, or make traveling more convenient. A part of these changes may be in our choice of transportation modes. Already now a change from fossil fueled vehicles to electric ones can be observed. Whether this change is here to last or will make an impact at all remains to be seen.

To try to understand and find correlations between the level of extroversion and choice of different transportation modes I have come up with an idea based on the few studies that do exist and tackle similar subjects and questions. The research question of the study was: how does extroversion correlate with the choice of transportation mode among people living in Norway? The hypothesis was that people who would score higher on extroversion would be more likely to choose cars as their main mode of transportation, and people who would score lower on extroversion would be more inclined to take public transport. The main goal of the study was to try to identify if extraversion has a positive correlation with car driving and if introversion has a positive correlation with public transport use. The secondary goal was to try to get an idea of the population's transportation habits.

An internet survey in the form of an anonymous questionnaire has been developed by me with statements measuring the level of extroversion based on John & Srivastava (1999). 58 participants have taken part in the survey. Three main analyses were run in IBM SPSS program in order to find out the descriptives of the items from the survey, how reliable the extroversion and introversion items were, as well as the correlations between transportation mode choices and the level of extraversion and introversion.

In the end only one out of five extroversion variables had a significant positive correlation with car driving, and all three introversion variables had a significant negative correlation with car driving. In addition a new variable was created by calculating the mean of the three introversion variables. The new variable called "introversion" was then correlated with the three transportation mode variables. This yielded a more significant correlation with car driving. Perhaps not surprisingly being talkative and full of energy had a significant positive correlation with cycling. No other significant correlations were found. It can be argued that at the very least half of the hypothesis i.e more extrovert people tend to take the car, was correct. However it can also be argued that the flaws in the study design and methodology take away from the results. A flaw that stands out in particular to me is the inability to

generalize the findings due to age and gender of the participants not being investigated. The study in my eyes has room for improvement, but it could possibly be a point of reference for a future study and further fill out the literature gap that exists in that particular field. The goals of the study have been achieved in my mind in the end and I am satisfied with my effort despite the flaws in the study.

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## 7.0: Appendix

### Extraversion and its effects on the choice of transport modes

Mandatory fields are marked with a star \*

#### Extraversion and its effects on the choice of transport modes

The goal of this survey is collecting data concerning the effects of extraversion on the choice of transport modes as a part of my bachelor thesis. All the answers will be anonymous, meaning no personal information will be collected. To participate in this survey the respondent must be at least 18 years old. It will take around 6 minutes to answer the survey.

Privacy and anonymity of the respondent is ensured and no information or assessments that can be linked to an identified or identifiable natural person will be collected or saved.

Are you at least 18 years old? \*

Yes

No

Do you confirm and consent to participating in this survey about the effects of extraversion on transportation choice? \*

Yes, I confirm and consent

No, I do not consent

#### The following part of the survey includes questions about participant's ability to use different transport modes


Do you have a car license (B class license)? \*

**i** This element is only shown when the option "Yes, I confirm and consent" is selected in the question "Do you confirm and consent to participating in this survey about the effects of extraversion on transportation choice?"

Yes


No

Do you have a driver's license for any other vehicle ? \*

 This element is only shown when the option "Yes, I confirm and consent" is selected in the question "Do you confirm and consent to participating in this survey about the effects of extraversion on transportation choice?"


- No
- Moped license (AM)
- Light weight motorcycle license (A1)
- Medium weight motorcycle license (A2)
- Heavy weight motorcycle license (A)
- Three- or four wheeled motorcycle license (B1)
- Light truck / lorry license (C1)
- Truck / lorry license (C)
- Minibus license (D1)
- Bus license (D)
- Tractor license (T)
- Other license (BE, C1E, CE, D1E, DE, S)

Do you have a car available for daily use? \*


 This element is only shown when the option "Yes, I confirm and consent" is selected in the question "Do you confirm and consent to participating in this survey about the effects of extraversion on transportation choice?"

- Yes
- No


Do you have any other vehicles available for daily use? If yes, what vehicle(s)? \*

 This element is only shown when the option "Yes, I confirm and consent" is selected in the question "Do you confirm and consent to participating in this survey about the effects of extraversion on transportation choice?"

Do you have a bicycle available for daily use? \*

 This element is only shown when the option "Yes, I confirm and consent" is selected in the question "Do you confirm and consent to participating in this survey about the effects of extraversion on transportation choice?"


Do you have a bicycle available for daily use? \*

 This element is only shown when the option "Yes, I confirm and consent" is selected in the question "Do you confirm and consent to participating in this survey about the effects of extraversion on transportation choice?"

Yes

No

What type of area do you live in? \*

 This element is only shown when the option "Yes, I confirm and consent" is selected in the question "Do you confirm and consent to participating in this survey about the effects of extraversion on transportation choice?"


Rural area / village

Small town (below 50.000 inhabitants) e.g Sola, Haugesund, Tromsø, Molde, etc.

Bigger town / city (above 50.000 inhabitants) e.g Sandnes, Stavanger, Bergen, etc.



How far do you have to travel every day? \*

 This element is only shown when the option "Yes, I confirm and consent" is selected in the question "Do you confirm and consent to participating in this survey about the effects of extraversion on transportation choice?"


Less than 10km

11 - 50 km

51 - 150 km

More than 150 km

Do you have to travel to a different municipality (kommune) for work, school, etc.? \*

 This element is only shown when the option "Yes, I confirm and consent" is selected in the question "Do you confirm and consent to participating in this survey about the effects of extraversion on transportation choice?"


Yes

No



The following part of the survey includes statements about participant's level of extraversion.

I am a talkative person \*

 This element is only shown when the option "Yes, I confirm and consent" is selected in the question "Do you confirm and consent to participating in this survey about the effects of extraversion on transportation choice?"

Strongly agree


Agree

Neither agree nor disagree

Disagree

Strongly disagree

I am a reserved person \*

 This element is only shown when the option "Yes, I confirm and consent" is selected in the question "Do you confirm and consent to participating in this survey about the effects of extraversion on transportation choice?"



## I am a reserved person \*

**i** This element is only shown when the option "Yes, I confirm and consent" is selected in the question "Do you confirm and consent to participating in this survey about the effects of extraversion on transportation choice?"

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

## I am full of energy \*

**i** This element is only shown when the option "Yes, I confirm and consent" is selected in the question "Do you confirm and consent to participating in this survey about the effects of extraversion on transportation choice?"

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

## I generate a lot of enthusiasm around me \*

**i** This element is only shown when the option "Yes, I confirm and consent" is selected in the question "Do you confirm and consent to participating in this survey about the effects of extraversion on transportation choice?"

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

## I tend to be quiet \*

**i** This element is only shown when the option "Yes, I confirm and consent" is selected in the question "Do you confirm and consent to participating in this survey about the effects of extraversion on transportation choice?"

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree



**I have an assertive personality \***

**i** This element is only shown when the option "Yes, I confirm and consent" is selected in the question "Do you confirm and consent to participating in this survey about the effects of extraversion on transportation choice?"

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

**I am shy and inhibited at times \***

**i** This element is only shown when the option "Yes, I confirm and consent" is selected in the question "Do you confirm and consent to participating in this survey about the effects of extraversion on transportation choice?"

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

**I am outgoing and sociable \***

**i** This element is only shown when the option "Yes, I confirm and consent" is selected in the question "Do you confirm and consent to participating in this survey about the effects of extraversion on transportation choice?"

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

**The following part of the survey includes questions about participant's transportation habits.****How often have you driven a car during the last twelve months ? \***


**i** This element is only shown when the option "Yes, I confirm and consent" is selected in the question "Do you confirm and consent to participating in this survey about the effects of extraversion on transportation choice?"

In this context "occasionally" means on and off, not necessarily every single day.

- Never
- Occasionally during the past 12 months
- Occasionally during the past 6 months
- Occasionally during the past 3 months
- Occasionally every month
- Occasionally every week
- Several times a week




How often have you used public transportation during the last twelve months? \*

 This element is only shown when the option "Yes, I confirm and consent" is selected in the question "Do you confirm and consent to participating in this survey about the effects of extraversion on transportation choice?"

In this context "occasionally" means on and off, not necessarily every single day.

- Never
- Occasionally during the past 12 months
- Occasionally during the past 6 months
- Occasionally during the past 3 months
- Occasionally every month
- Occasionally every week
- Several times a week

How often have you cycled during the last twelve months? \*

 This element is only shown when the option "Yes, I confirm and consent" is selected in the question "Do you confirm and consent to participating in this survey about the effects of extraversion on transportation choice?"

In this context "occasionally" means on and off, not necessarily every single day.

- Never
- Occasionally during the past 12 months
- Occasionally during the past 6 months
- Occasionally during the past 3 months
- Occasionally every month
- Occasionally every week
- Several times a week