Háskólinn á Akureyri

Are people with insomnia more frequently suffering from seasonal affective disorder? An Icelandic study

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Abstract

Insomnia is the most common sleep disorder and can impair cognitive functions. People suffering from insomnia can experience lesser quality of life. These individuals are also more likely to suffer from a major depressive illness and 90% of people with depression complain about their sleep quality. Seasonal Affective Disorder (SAD) is a subtype of major depression and implies that your mood changes with the seasons resulting in depression in the winter times. SAD can also happen during the summer time but according research there are no reports of summer SAD in Iceland. Our research had 249 participants, of both genders from ages 18 - 92. We used the Bergen insomnia scale (BIS) to measure insomnia and the Seasonal pattern assessment questionnaire (SPAQ) to measure seasonal depression. After we calculated the SAD scores with the SPAQ we combined Seasonal Affective Disorder (SAD) and Subclinical Seasonal Affective Disorder (S-SAD). We did a Spearman correlation and a Chi-square test.

There was a significant interaction between insomnia and S-SAD (chi squared = 17.369 and p= 3.078e-05) and a significant correlation between the BIS-score and the Global seasonality score according to the SPAQ (rho=,3 p=.001). Out of those who were suffering from S-SAD or SAD, 30 of them had insomnia and 8 of them did not have insomnia. This shows us that there is a link between insomnia and SAD. Limitations may include the SPAQ questionnaire as there have been studies showing that the specificity and sensitivity was low. In spite of these limitations, the SPAQ questionnaire is good as a screening instrument. Another limitation we encountered was the sample size. To reach the +/-3% precision we should have around 1111 participants but we only had 249 participants, which is approximately 0,007% of the whole population.

It is necessary to conduct future research regarding SAD and the treatments for SAD in Iceland.

Útdráttur

Svefnleysi er algengasta svefnröskunin og getur haft neikvæð áhrif á hugræna getu. Einstaklingar sem þjást af svefnleysi geta átt það á hættu að upplifa minni lífsánægju. Þessir einstaklingar eru einnig líklegri til þess að þjást af alvarlegu þunglyndi og 90% einstaklinga með þunglyndi kvartar yfir svefngæðum sínum. Skammdegisþunglyndi er undirflokkur alvarlegs þunglyndis og felur í sér að skap einstaklinga breytist með árstíðarskiptum sem verður til þess að þeir upplifa þunglyndi yfir vetrartímann. Einstaklingar getur einnig upplifað skammdegisþunglyndi að sumri til en rannsóknir sýna að það séu engin merki um þá tegund skammdegisþunglyndis á Íslandi. Rannsóknin okkar inniheldur 249 þátttakendur, af báðum kynjum frá aldrinum 18-92 ára. Við notuðum Bergen insomnia scale (BIS) til þess að mæla svefnleysi og Seasonal Pattern Assessment questionnaire (SPAQ) til þess að mæla skammdegisþunglyndi. Þegar að við vorum búnar að reikna niðurstöðuna úr SPAQ könnuninni sameinuðum við skammdegisþunglyndis kvarðann og undirkvarðann. Þá skoðuðum við fylgni Spearman og gerðum Kí-kvaðrat próf. Það var samband á milli svefnleysis og skammdegisþunglyndis (kí-kvarði = 17.369 og p= 3.078e-05) og marktæk fylgni á milli BIS niðurstaðanna og Global seasonality niðurstaðanna samkvæmt SPAQ (rho=,3 p=.001). Af þeim sem þjáðust af skammdegisþunglyndi þjáðust 30 þeirra einnig af svefnleysi en 8 þeirra þjáðust ekki af svefnleysi. Þetta sýnir okkur að það er samband á milli svefnleysis og skammdegisþunglyndis. Takmarkanir á rannsókninni gætu verið SPAQ spurningarlistinn þar sem gerðar hafa verið rannsóknir sem sýna að sérkenni og næmni spurningarlistans eru lág. Þrátt fyrir þessar takmarkanir þá er SPAQ spurningarlistinn góður sem skimunarlisti. Annað sem takmarkaði rannsóknina var úrtaksstærðin. Til þess að ná +/- 3% nákvæmni þyrftum við að hafa um 1111 þátttakendur en við vorum einungis með 249, sem er um 0,007% af þjóðinni. Það er nauðsynlegt að gera frekari rannsóknir varðandi skammdegisþunglyndi og meðferðir á því.

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1. Introduction

1.1. Insomnia

Sleep is an essential component of health. Sleep affects the wellbeing and the quality of life of individuals (Jensen and Herr, 1993). Sleep disorders are very prevalent in the general population. When categorized, insomnia is the most common (Vgontzas and Kales, 1999). The term insomnia can be used to describe many types of sleep problems such as long sleep latency, prolonged periods of wakefulness during the time you are trying to sleep or frequent nocturnal awakenings (Roth, 2007). Insomnia is caused by physical factors e.g. suffering from certain diseases, environmental factors, psychological factors and psychiatric problems (Zaini, 2013). One of the main symptoms of insomnia is being tired all day (Zaini, 2013). Insomnia impairs cognitive functions and is associated with many daytime functions across a number of social, physical and emotional domains (Roth, 2007). Insomnia can be evaluated in an office setting, where a multidimensional approach is recommended, including sleep hygiene measures, psychotherapy and medication (Vgontzas and Kales, 1999). Categorizing the severity of insomnia ranges from transient to chronic (Ohayon, 2002). People with insomnia are 2.5 to 4.5 more likely than others to have an accident (Roth, 2007). They also have decreased quality of life, diminished job performance and an increase in health utilization (Roth, 2007). People living with insomnia can experience a lesser quality of life than those who do not suffer from insomnia (Tsuno, Besset and Ritchie, 2005).

In 1995, people in three different countries participated in a sleep study for insomnia (Janson et al.) The study involved Iceland, Sweden and Belgium. The results showed among other things that the participants in Reykjavík, Iceland used more caffeine and had a higher BMI (body mass index). The study also showed that there were fewer nocturnal awakenings in Iceland and also fewer reported nightmares. The participants in Reykjavík were also going to bed one hour later and waking up one hour later than the participants in the other two cities (Jansson et al., 1995).

Insomnia is usually treated pharmacologically but with recent studies the use of cognitive behavioural therapies have shown to be a successful way of treating insomnia (Fiorentino and Ancoli-Israel, 2006). More unorthodox treatment is meditation, which targets the brain and body in contrast to pharmaceutical interventions which solely targets neurotransmitter system in the brain (Jerath, Beveridge and Barnes, 2019).

1.2. Seasonal affective disorder

Seasonal Affective Disorder (SAD) is when mood and behaviour changes with the seasons, resulting in depression or anxiety in the dark winter times (Magnússon and Stefánsson, 1993). SAD is an undertype of major depression with a seasonal pattern (Sherri, 2015). It includes depressive episodes of mild to moderate severity (Lam, 2016).
The only distinction between SAD and major depression are the timing of the episodes (Targum and Rosenthal, 2008).

Seasonality affects people from all over the world (Targum and Rosenthal, 2008) However, women are four times more likely to suffer from SAD than men (Parrish, 2018). Those who live farther from the equator are also more at risk than those who do not (Sherri, 2015).

Finding the prevalence is on the other hand difficult since it may be underdiagnosed or unreported (Sherri, 2015). The age of onset is between 18 and 30 years (Sherri, 2015).

There is an increase in the winter time of people seeking help for major depression symptoms (Parrish, 2018) and people suffering from SAD were influenced in their sick days by seasonal fluctuations (Winkler, Reichardt, Kranz, Bartova, Kasper and Pjrek, 2019). According to Lam (2016) the patient has the first onset in October and the typical offset is in April. The patient sleeps more hours but still feels fatigued, needing to nap. Lam also notes that this comes with increased appetite that can lead to winter weight gain up to 20 pounds (Lam, 2016).

There are other symptoms which contribute to the weight gain such as carbohydrate craving and alcohol disorders (Morales-Munoz, Koskinen and Partonen, 2017).

With increasing age, it can become more and more difficult to lose the weight again during the summer time so it becomes a year-round problem (Lam, 2016).

Usually this symptom cluster can last up to four or five months until the days become longer again (Targum and Rosenthal, 2008). But people with SAD can also get depressed in cloudy weather at any time of the year (Targum and Rosenthal, 2008).

SAD also has cognitive symptoms of depression like self-blame and feelings of guilt (Lam, 2016) and SAD patients also often complain of hypersomnia and daytime sleepiness (Morales-Munoz, Koskinen and Partonen, 2018).

Diagnosis of SAD can be retrospective and based on the patient's history, therefore it can be subject to recall bias (Winkler, Reichardt, Kranz, Bartova, Kasper and Pjrek, 2019). SAD can also be diagnosed with a clinical interview or using the Seasonal Pattern Assessment

Questionnaire (SPAW) which was specially developed for SAD (Targum and Rosenthal, 2008).

Although SAD is not as severe as depression it has symptoms affecting both the person in a negative way and the people around them (Lam, 2016).

Patients with winter SAD usually don't attempt suicide or require hospitalisation (Lam, 2016). This suggests that this may be an overlooked illness, because it is not defined as depression, with symptoms being more severe. This is caused by the patients being aware of the seasonal nature of their mood change. They know their mood will likely improve over the next few months with changes in weather (Lam, 2016). SAD can affect people's work in the winter time since people suffering from SAD were influenced in their sick days by seasonal fluctuations (Winkler, Reichardt, Kranz, Bartova, Kasper and Pjrek, 2019).

In a study done by Andrés Magnússon and Jón G. Stefánsson in 1993 there were no cases of summer SAD in Iceland. They conducted a study consisting of 1000 men and women from the age of 17-67 which estimated people suffering from SAD at about 3,8% of the sample size. This is significantly lower than on the east coast of the United States, which is surprising given the latitude of Iceland (Magnússon and Stefánsson, 1993).

A study done by Christer Janson et al. in 1995 on insomnia in three different countries indicated that there was no seasonal variation between the darker and lighter months, meaning there was little to no difference (Janson et al., 1995).

Icelanders have a lower rate of SAD than other countries even though Iceland is located in the north and therefore has less sun during the winter time (Magnússon, Axelsson, Karlsson and Óskarsson, 2000).

It was hypothesized that Icelanders have had a population selection which made them more tolerable to the dark winter times than others (Magnússon, Axelsson, Karlsson and Óskarsson, 2000). Twin and family studies have also shown a genetic component to SAD (Ho, Han, Nielsen, Jancic, Hing, Fiedorowicz, Weissman, Levinson and Potash, 2018). Some options like healthy lifestyle interventions can aid in minimizing the disruptive SAD symptoms (Leahy, 2017).

This research area is in dire need of sufficiently reproducible and large-scale control trials (Cools, Hebbrecht, Coppens, Roosens, De Witte, Morrens, Neels and Sabbe, 2018).

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1.3. The link between insomnia and depression

There is no psychiatric disorder more frequently associated with a medical illness than insomnia, including depression (Roth, 2007). This tells us that effects of sleep deprivation may be underestimated (Pilcher and Huffcutt, 1996).

The association of depression and insomnia likely comes from the common underlying pathophysiological mechanisms for mood regulation and sleep that make the patient sensitive to both conditions (Roth, 2007). Individuals with insomnia are more likely to suffer from a major depressive illness than those who do not suffer from insomnia (Ohayon, 2002).
With that being said approximately 90% of patients with depression complain about their sleep quality (Zammit, Weiner, Damato, Sillup and McMillan, 1999).
When patients complain about sleep problems, physicians are more likely to diagnose depression rather than insomnia (Kripke et al., 2002).

Morales-Munoz, Koskien and Partonen did a study regarding the difference in sleep functioning between individuals with SAD and major depression in Finland. 4153 individuals participated in their study who did various tests to measure sleep and depression. Their conclusion was that individuals with SAD and major depression showed sleep problems (Morales-Munoz, Koskinen and Partonen, 2018).

Sleep disturbance was formerly regarded as a main secondary manifestation of depression, but now studies have shown insomnia to be an independent risk factor or the development of recurrent or emerging depression among all ages (Fang, Tu, Sheng and Shao, 2019). This bidirectional association between both depression and sleep disturbance have now made a different perspective, that sleep problems are not an epiphenomenon of depression anymore but a predictive prodromal symptom (Fang, Tu, Sheng and Shao, 2019).

2. Motivation

When looking at the studies done on the link between insomnia and SAD there was not a single one dedicated to this aspect in Iceland, only the study of Janson (Janson et al., 1995) examined seasonal variation of insomnia, but not seasonal affective disorder. There are several aspects of previous studies which need to be investigated further in Iceland. Magnússon and Stefánsson examined SAD in their studies but not insomnia. Magnússon et al. (2000) used the hospital anxiety and depression scale but we used the seasonal pattern assessment

questionnaire alongside with two scales that also examine depression, namely the PHQ and DASS.

When looking at the study done by Janson et al. 1995 the participants were in Reykjavík and/or around the area. This suggests that the participants were only in the capital of Iceland. The students contributing to the statistics of these questionnaires are long distance students from the University in Akureyri, which probably means that our participants are from all over Iceland, not only Reykjavík. People who live in bigger cities have the option of doing things that people who live more isolated have not. In cities you can for example go to the bar or the cinema and meet people. If you live more isolated it is perhaps darker and you might have less option to socialize.

3. Research question and hypothesis

Our research question is "are people with insomnia more frequently suffering from SAD in Iceland than those who don't have insomnia? We believe that there is a connection between the two disorders so our hypothesis is that people with insomnia are frequently suffering from SAD in Iceland. The 0-hypothesis would be that people with insomnia are not suffering from SAD more frequently than those without insomnia in Iceland.

Our study will try to determine if there is a link between insomnia and seasonal depression in Iceland. If we are able to do so we hope that it will help people to get a correct diagnosis of their problems and the right treatment as well.

4. Methods

4.1. Ethics

The NBC in Iceland approved the study and the study documents. The study number is VSN-18201 and the approval date 29.01.19.

We got informed consents from everyone who participated. We took good care of the anonymity. Everyone knew that they were participating voluntarily and could stop at any time. Our research did not harm the participants in any way.

4.2. Recruitment

We had to recruit 30 people each. 10 from 18-30 years old, 10 from 30-60 years old and 10 who were 60 years or older. We also recruited 8 additional people. In total, we were 8 students who recruited altogether 162 participants.
We recruited people by taking advantage of our social network. We got help from our local senior home Höfði to recruit people who were 60 years old or older.

4.3. Participants

Participants were of both genders. We had 249 participants after excluding missing data, participants who did not live in Iceland or who indicated that their mother language was not Icelandic.

We had 137 women and 102 men. 9 did not want to reveal their sex.
For women the mean age was 44.88, the median age was 38.5, lowest age was 18 and highest age was 88.
For men the mean age was 45.73, the median age was 40, lowest age was 20 and highest age was 92.

For people to be able to participate they had to live currently in Iceland and speak Icelandic as a native language.

4.4. Materials

The Bergen Insomnia Scale is used to measure if a person has sleeping problems which are so severe they would be classified as insomnia (Pallesen, Nordhus, Bjorvatn, Sivertsen and Hjørnevik, 2008).

So far it is not available in Icelandic so our group translated it from English to Icelandic and then back translated it again (from Icelandic to English) to make sure the translation was easily understandable and correct. We also translated a part of the Morningness-Eveningness

Questionnaire, but that is used to measure whether a person is a morning person or an evening person (Horne and Östberg, 1976). We then made a questionnaire with all of the tests our group had done together, The Questionnaires are: The Bergen Insomnia Scale (Pallesen, Nordhus, Bjorvatn, Sivertsen and Hjørnevik, 2008), The Morningness-Eveningness Questionnaire (Horne and Östberg, 1976), the Motor Imagery Questionnaire (Gregg, Hall and Butler, 2007), Depression, Anxiety and Stress Scale (Tyrfingsson, n.d.), Seasonal Pattern Assessment Questionnaire (Rosenthal, 2013) and Patient Health Questionnaire (Kroenke, Spitzer, Williams and Löwe, 2010). Our research was based in Iceland so by translating the Bergen Insomnia Scale to Icelandic, we were making it more approachable and understandable for people with Icelandic as their native tongue, especially for older people.

We conducted the research and used the data to answer our research question. For the purpose of the study we used the data of the Bergen insomnia scale, the SAD and general questions about age and gender. We summed up the scores on the question nr. 1 of the Icelandic version of SPAQ, yielding the global seasonality score.

4.5. Statistics

We obtained our data by handing out questionnaires. Our variables include sex, age, if they live in Iceland, if Icelandic is their native tongue, if they use nicotine, if they consume any caffeine, how many hours they slept last night, when they got up in the morning and when they went to bed last night. We also asked how the weather was when they answered the questionnaire and finally the women were asked where they were in the menstrual cycle. The participants also answered all of the questionnaires we listed above in materials. We used two of the questionnaires for our data, the Bergen Insomnia Scale (Pallesen, Nordhus, Bjorvatn, Sivertsen and Hjørnevik, 2008) and the Seasonal Pattern Assessment Questionnaire (Rosenthal, 2013). We divided people into two groups depending on if they suffer from insomnia or not.

Our data was nominally divided for insomnia and the GSS score was on an ordinal scale. Then we did a Chi-squared test to compare the values of the SAD scale for both people with and without insomnia.

To measure insomnia, we had the BIS scale which has 6 items rated 0 to 7 on a Likert scale (0= no symptoms, 7= extreme). The total score can range from 0-42. A score of 3 or higher in at least one of the first 4 items and at least one of the last 2 items is considered to be insomnia. To measure SAD, we used the SPAQ. We then combined SAD and S-SAD. The cut off value for SAD according to Magnússon (1996) is a GSS score over 10. That is when seasonal change is at least a moderate problem and people feel worst during the winter month. Kasper et al. (1998) consider the cut off value for Subclinical Sad or S-SAD is a GSS of 10 or higher, seasonal change is no or only a mild problem and people feel worst during the winter months or a GSS score of 9-10, seasonal change at least a mild problem and people feel worst during the winter months.

We divided GSS into groups. The groups were: High with a score of 10 or higher, low with a score or 9 or lower and medium with a score of 9 - 10.
The SAD groups were no SAD vs. subclinical and clinical SAD.

5. Results

5.1. Statistics

We adjusted the critical alpha level by using a Bonferroni correction. Because we did a Spearman correlation and a Chi-squared test we divided by 2. Therefore, we consider a p lower than 0.025 to be significant.

We calculated the Global Seasonality Score

Table 1. The GSS/Age distribution

GSS/Age	<31	30-59	>59
High	17	17	6
Low	61	53	73
Medium	11	9	2

In Table 1 we see the GSS distribution with age

Table 2. GSS/Gender distribution

GSS/Gender	Female	Male
High	28	12
Low	102	85
Medium	16	6

In Table 2 we see the GSS distribution with gender. Most people score in the low column.

Table 3. No SAD and S-SAD distribution.

Distribution	N	Mean	Sd.	Median	Min	Max
No SAD	211	11.97	7.98	10	35	35
S-SAD	138	19.79	9.38	19.5	40	40

In table 3 we see the distribution between no SAD and S-SAD. This sample included 211 people who had no SAD and 138 with S-SAD or SAD.
A Pearson's Chi-squared test with Yates' continuity correction got us this data:
X-squared = 17.369, df = 1, p-value = 3.078e-05
With the p being lower than 0.025 we count this as significant.

This helps us evaluate how likely it is that any observed difference between the variables arose by chance. The Chi-squared test tells us that insomnia and SAD depend on each other. That means that people who suffer from insomnia are more likely to suffer from SAD and vice-versa. Since the p is low enough we find it significant we do not think that the difference arose by chance.

Table 4. This is the distribution between SAD and Insomnia

	Insomnia	No Insomnia
No SAD	86	125
S-SAD	30	8

The Spearman correlation was rho=.3; p<.001.
With the p being lower than 0.025 we count this as significant.

Correlation measures the strength of association between two variables and the direction of the relationship. Our correlation is considered to indicate a moderate positive relationship. The higher people score on the insomnia questionnaire (BIS) the higher they score on the seasonality questionnaire (GSS).

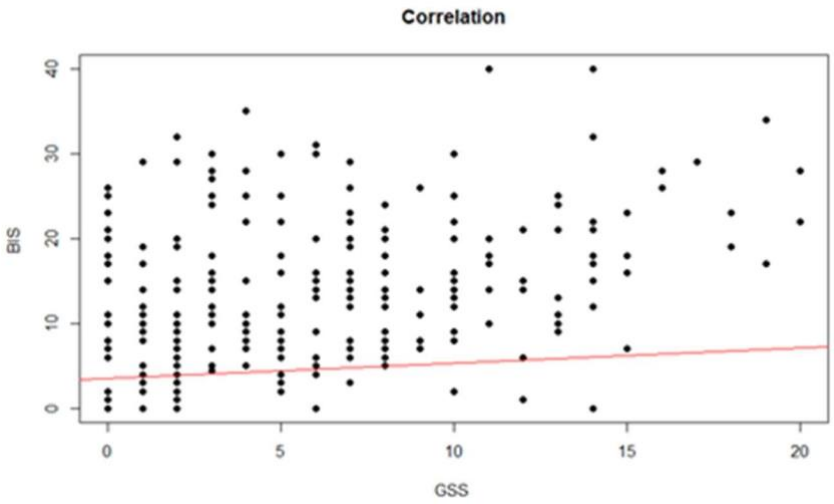

Figure 1. The correlation of the GSS/BIS calculated.
These calculations tell us that seasonality correlated with insomnia symptoms.

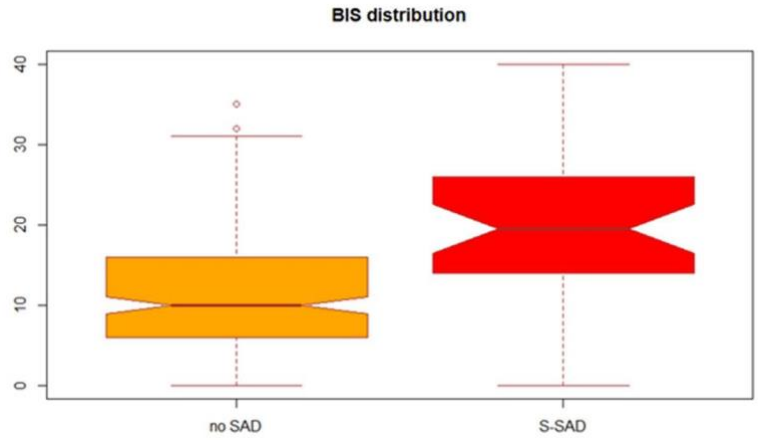

Figure 2. BIS distribution for the group with no SAD and S-SAD or SAD.

6. Discussion

What this data has shown us is that if you suffer from insomnia you are more likely to suffer from seasonal affective disorder as well. This also shows us that if you suffer from seasonal affective disorder you are more likely to suffer from insomnia as well.

We researched if people with insomnia are more frequently suffering from seasonal affective disorder than those who do not have insomnia in Iceland. Indeed, they do. According to the statistical reasoning of the tests we can reject the null-hypothesis. The results provide strong evidence that SAD is linked to insomnia.

6.1. Relation to previous work

Sherri (2015) concluded that people who live further from the equator are more likely to suffer from SAD. That was a factor in doing this research. With Iceland being so far from the equator, that it would be difficult to conduct this kind of research further from the equator. Another factor was the increase in people seeking help for major depression symptoms during the winter (Parrish, 2018). Usually the winter time and shorter days spans about 9 months of the year in Iceland, up to 10 months. This would make Iceland an ideal place for such a research and furthermore the results indicate this as significant. Parrish (2018) also said that women are four times more likely to suffer from SAD than men. That might contribute to our research since we had 137 women and 102 men who participated.

Morales-Munoz, Koskien and Partonen (2018) did a study in Finland in 2018 of a similar nature-where the conclusion was that individuals with SAD and Major depression showed sleep problems. Our expectation going into the study were similar to theirs and our conclusions and results were similar, but more thorough and showed the connection between insomnia and SAD.

6.2. Limitations for our study

For every study there are limitations. Ours is no different. The SPAQ questionnaire (Rosenthal, 2013) has its limitations. There is a paper by Magnússon (1996) about the validity of the SPAQ. 81 individuals who had previously participated in a community survey of seasonal affective disorder in Iceland were interviewed. The results were that the questionnaire sensitivity, specificity and positive predictive value for the group were 94%, 73% and 45% respectively (Magnússon, 1996). From these results the specificity is low. A paper from Mersch et al. (2004) showed similar results, that sensitivity in the questionnaire was low, at 44%. The results also said that even though the

SPAQ is not sensitive enough, it is accurate enough to be used as a screenings instrument (Merch et al., 2004).

The paper done by Magnússon (1996) also questioned the discrimination between SAD and S-SAD, so there was a poor case-finding ability for SAD.

Limitations may also include our sample size. According to a study Israel (1992) did, if you have more than a 100.000 people in a population, like Iceland, there should be around 1111 individuals participating to reach the +/-3% precision. According to numbers from Hagstofan, which is an independent establishment that the Icelandic prime minister oversees, there are 356,991 people in total in Iceland but we only had 249 participants and that is approximately 0,007 % of the whole population (Hagstofan, 2019).

6.3. Future directions

Cools, Hebbrecht, Coppens, Rossens, De Witte, Morrens, Neels and Sabbe (2018) stated that this area was in need of more trials and research and we agree.

What interested us the most was trying to find treatments for SAD. The Society for Light treatment and Biological Rythms was founded in 1987 and hundreds of research articles on SAD and light therapy have been published (Lam, 1998). The main light treatment for SAD is white-appearing light. Light therapy is usually done from early autumn when people show no symptoms yet to prevent onset of the depression (Nussbaumer-Streit et al., 2019).
After reading about the therapy we thought that light therapy was a good choice for SAD patients but then we were shown this article in Cochrane that said that they had examined if light therapy was effective and their results was that it is not. Cochrane had searched a database in 2018 and found only one randomised controlled study including 46 people. All the records they found were 3745 so one out of 3745 is not great. Cochrane thereby drew no conclusions if light therapy is effective in preventing winter depression (Nussbaumer-Streit et al., 2019). Another issue with light therapy is that it is also possible to have some placebo effect since the patients cannot be blind as to whether they are getting treatment or not (Eastman, 1990).
After finding these results we think that light therapy warrants further examination.

6.4. Conclusions

According to our results if you suffer from insomnia you are more likely to suffer from seasonal affective disorder as well. With these results, we hope to open up the chance of further studies on these subjects.

7. Roles of authors

Inga was in charge of insomnia and Halldóra was in charge of SAD. We each researched our references and then put them collectively in a document. Halldóra did the statistics and Inga did the tables and figures. Almost all of the work on the thesis was done together.

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