High Intelligence and Reporting of Adverse Effects

Aditi Hattangadi[1], Annemerle Beerthuizen[2], Jessica Voerman[2], Noks Nauta[3]

[1] Medical student from the Erasmus University in Rotterdam, The Netherlands

[2] Department of Medical Psychology and Psychotherapy, Erasmus MC, Rotterdam, The Netherlands

[3] Foundation for gifted and talented adults, Delft, The Netherlands

Number of text pages: 32

Number of figures: 2

Number of tables: 3

Correspondence concerning this article should be addressed to Aditi Hattangadi, Department of Medical Psychology and Psychotherapy, Erasmus MC University Medical Center, P.O. Box 2040, 3000 CA, Rotterdam, the Netherlands.

E-mail: 353122ah@student.eur.nl.

Abstract

Objective: There are many factors influencing reporting of adverse effects of medication. This study aims to investigate if (a) there is evidence supporting the idea that individuals with high intelligence (intelligence quotient (IQ) > 129) experience moderate to severe adverse effects more frequently than the general population and (b) what might explain individuals with high intelligence differing from individuals in the general population in perceiving or experiencing adverse effects of medication.

Method: A literature search was done to gather hypotheses. An online questionnaire was set up in LimeSurvey, in which 58 participants with high IQ answered questions on adverse effects of paracetamol, NSAIDs, allergy medication and asthma medication. Furthermore, 10 experts and 16 participants were interviewed on their view regarding high intelligence and reporting of adverse effects.

Results: No participants reported moderate to severe adverse effects. Literature reports brain differences between high intelligence and average intelligence, but it is unclear if these differences could be responsible for a difference in adverse effects. Experts revealed personality characteristics might be a more likely explanation. Participants who categorized personality characteristics as signs of high intelligence were more likely to accept high intelligence as a factor in experiencing more adverse effects.

Conclusions: An increase in reported moderate to severe adverse effects of medication was not seen in this study. Further research should look into types of medication affecting the brain, views of individuals with high IQ who are not affiliated to high IQ organizations, and personality characteristics of those who report more adverse effects.

Keywords: high intelligence, intellectual giftedness, moderate adverse effect, severe adverse effect, medication

Introduction

High intelligence is defined as an intelligence quotient (IQ) score larger than 129, which refers to a statistical difference of 2 standard deviations (SD=15) from the average IQ of the general population (IQ=100) (Wechsler, 1958). *Webb et al. (2005)* state that high IQ might lead to experiencing smaller or larger effects of medication. Furthermore, individuals with high intelligence might report more side effects than the general population. Thus, these individuals may require an adjustment of the conventional dosage or therapy. There might be several explanations for high intelligence relating to differences in effects of medication.

Firstly, studies have offered suggestions as to how intelligence might be linked to differences in experienced side effects. *Mrazik & Dombrowski (2010)* suggest high intelligence may be attributed to neurobiological differences. Subdivision of the areas of the cortex might differ (Vuoksimaa et al., 2016). These areas are also shown to be more active in individuals with high intelligence than in individuals with average intelligence during complex cognitive tasks (Graham et al., 2010). Individuals with high IQ might create a more efficient network of connections, which also allows for an increase in control over energy expenditure (Schultz & Cole, 2016). Furthermore, higher levels of a metabolite, N-acetyl aspartate (NAA), positively correlate with IQ (Patel, Blyth, Griffiths, Kelly, & Talcott, 2014). Brain activity might be correlated with cerebral blood flow (Takeuchi et al., 2011). If blood flow differs, it could be suggested that drugs are delivered differently (Khalili-Mahani et al., 2014). *Furmark et al. (2002)* have shown that the reverse is possible, as citalopram-induced changes in blood flow relate to a reduction in social phobia in their study.

Secondly, sensitivity to sensory stimuli could play a role in experiencing more side effects. Sensitivity to sensory stimuli allows for better processing and better discrimination of sensory stimuli (Aron & Aron, 1997; Jagiellowicz et al., 2011). It has been determined that 214 of 245 (87%) of individuals with high intelligence adults obtain a high score on this scale (Van de Ven et al., manuscript in preparation). Yet, it has been reported that neuroticism could be responsible for the relationship between sensitivity to sensory stimuli and reporting of adverse

effects. Low sensory threshold and ease of excitation relate well to neuroticism. Neuroticism in turn predicts reporting of somatic and psychological subjective health complaints (Listou Grimen & Diseth, 2016).

On the other hand, it has been shown that higher childhood intelligence test scores are associated with lower BMI scores as an adult (Lawlor, Clark, Davey Smith, & Leon, 2006). Furthermore, childhood intelligence is also associated with adult height (Harris, Brett, Deary, & Starr, 2016). A difference in physique could alter the level of medication in the blood, which could result in an increased frequency of side effects. *Deary et al. (2009)* show that a higher verbal intelligence score is associated with a higher compliance rate. A higher compliance rate implies that a consistent dosage is reached every day, which might increase the chance of side effects.

Individuals with high intelligence also take interest in their health. High IQ has been linked to an improvement in health literacy, which in turn improves functional health status (Mõttus et al., 2014; Serper et al., 2014). While increased health literacy has positive effects, acquiring knowledge of possible side effects might not be beneficial. *Petersen et al. (2014)* demonstrated that mentioning the amount of side effects due to placebo use can increase the number of reported side effects (the nocebo effect). Yet, *Peerdeman et al. (2016)* showed that positive expectations of analgesic placebos also lead to a larger analgesic effect. Therefore, placebo and nocebo effects could lead to a higher and lower effect of medication, respectively, requiring a lower and higher dosage of medication. This would also explain why some individuals with high intelligence individuals might attribute a higher effect of medication to high intelligence, while others attribute a lower effect.

The association between level of intelligence and the number of experienced drug effects and adverse drug effects has not been studied yet, to the best of our knowledge.

To study this association, we aim to answer two research questions:

1. What is the evidence for the idea that there is an *association* between *high intelligence* and *the number and severity of side effects* reported by individuals with high intelligence compared to individuals from the general population?
2. What is the evidence for the idea that there is a *difference in reported effects of medication* between individuals with high intelligence and individuals from the general population?

A literature search was done to generate and gather hypotheses. Furthermore, individuals with high intelligence and experts were interviewed.

Methods

Literature

The bibliographic databases Pubmed, Google Scholar and Web of Science were utilized to determine if the search terms 'medication' or 'drugs' AND 'intelligence' or 'high intelligence' or 'individuals with high intelligence' or 'high IQ' or 'intellectual giftedness' occurred together in scientific literature. Furthermore, reference lists of articles and studies that referenced articles of interest were examined. Search results that were presented in full-length and in English were consulted.

Online questionnaires

To limit the extent for this study, high intelligence was defined as an IQ higher than 129. It is proposed that 2,5% of the population is able to obtain this result (Godwin & Smith, 2012). Members of Mensa Nederland (n=2533) and those affiliated to the Gifted Adults Foundation of the Netherlands (Instituut Hoogbegaafdheid Volwassenen, IHBV) (n≅2000) were asked to participate. Both organizations offer affiliated individuals information on how to identify high IQ. Mensa Nederland requires its members to score higher than 129 on their IQ test. Therefore, it was likely that most affiliated individuals had tested their IQ. To recruit participants, e-mails were sent to these individuals and a message was published on the IHBV website. Inclusion and

exclusion criteria can be found Table 1. Messages were also posted in communal social media (LinkedIn, Facebook) groups.

Online questionnaires were set up in LimeSurvey (version 2.06; www.limesurvey.org), thus making it accessible to individuals with high intelligence all over the Netherlands. Participants were given written information at the beginning each online survey. Informed consent was obtained by asking participants to confirm whether they agreed with the conditions stated in the written information.

A preliminary questionnaire (n=115) showed that paracetamol, non-steroidal anti-inflammatory drugs (NSAIDs), allergy medication and asthma medication were most commonly used. In a following questionnaire, questions regarding side effects of these types of medication were asked. Participants of the preliminary questionnaire (n=115) were invited by e-mail to participate in the main questionnaire. Two participants left incorrect contact details, resulting in 113 prior participants who were approached for the main questionnaire.

Primary study parameters of the main questionnaire were the amount of moderate to severe side effects reported by the individuals with high intelligence and expectations prior to medication administration. Secondary study parameters were perceived effectiveness of medication and patient expectations while receiving a prescription from the doctor. These were rated on a Visual Analogue Scale from 1 to 10. Interviews were conducted with individuals who expressed their interest in the latter questionnaire.

This study was categorized as exempt from ethical approval from the Medical Ethical Research Committee (METC) of the Erasmus Medical Centre (MEC-2017-260).

The online questionnaires can be found in Appendix A.

Expert and participant interviews

Hypotheses stated in the introduction were presented to experts. Experts were interviewed live (n=6), by telephone (n=2) or by mail (n=2). The primary objective of these interviews was to determine likelihood of hypotheses and generate additional hypotheses. Experts from different

specialties were pursued: 1 psych-pharmacologist, 1 pharmacologist, 2 pharmacists, 2 general practitioners, 2 researchers specializing in psychology and high intelligence, and 2 psychiatrists. Experts were already known to the researchers (n=7), referred by the IHBV (n=2) or referred by an expert we had interviewed (n=1). Semi-structured expert interviews were conducted in person (n=6), by e-mail (n=2), or by telephone (n=2). All interviews were conducted by a medical student (AH). At the beginning of the interview, every expert was granted a chance to generate hypotheses. Further on, experts were asked to comment on the likelihood of hypotheses that were already gathered.

Participants were selected for a telephone interview if they had submitted a phone number in the second questionnaire. A further selection of participants was made by including participants who had made statements which required more clarification. For example, some participants answered that their desired dosage is the same as their current dosage, whilst expressing that they would prefer the medication to be more effective. Thus, follow up questions primarily focused upon personal opinions and expectations. In addition, scientific references and sources were also asked. Expert and participant interview questionnaires can be found in appendix B.

Table 1. Inclusion and exclusion criteria for selection of participants.

Inclusion criteria	**Exclusion criteria**
Completed questionnaire	IQ test result < 130 or unclear
Use of paracetamol, NSAIDs, allergy and asthma medication during questionnaire	Online IQ test
	Did not provide how IQ was tested

Statistical analyses

Side effects reported by individuals with high intelligence were compared to side effects reported by the general population. Only completed questionnaires were analyzed. Participants were also excluded if they were not able to provide a reliable IQ test, to name the IQ test or to

indicate an IQ test score. Unreliable tests were defined as tests which were not validated by psychologists, such as online intelligence tests. Adverse effect reporting in our data was compared to data from general pharmaceutical databases, open-source data from the Netherlands Pharmacovigilance Centre (Lareb), and the Common Terminology Criteria for Adverse Events (CTCAE version 4.03). A chi-squared test was utilized to analyze if individuals with high intelligence experienced more severe side effects than the general population. Expectations prior to medication administration were described qualitatively.

Participants were also asked to rate perceived effectiveness of the medication and their expectations whilst receiving a prescription from the doctor. They were offered to rate both on a Visual Analogue Scale from 1 to 10 (1=highly negative expectations, 10 = highly positive expectations). These ratings were analyzed using a Mann-Whitney *U* test. All data analyses were performed using SPSS software 21. In all cases, the significance level was α=0,05.

Results

Literature and expert interviews

A literature search on the association between IQ and medication yielded no studies concerning both IQ and effectiveness or adverse effects of medication. Yet, there were differences mentioned in the literature that could possibly affect effectiveness of medication or reporting of adverse effects of medication. These were constructed as hypotheses and presented to the experts, who judged likelihood of these hypotheses. Female and male sex were represented equally among the experts. None of the experts had their IQ tested.

The results of the interviews are summarized in table 2. Experts disagreed on three issues: method of ingestion, brain structure and health literacy. By method of ingestions, it is meant that individuals with high intelligence reported that they experienced less side effects if method of administration was changed. For example, intake of paracetamol that was first dissolved in water resulted in less side effects than if a tablet was taken orally. On method of administration, experts (n=4) mentioned that NSAIDs could harm the gastric mucosa. Therefore,

it would be only beneficial in individuals with a predisposition for gastric ulcers to dissolve this into water first. Other experts (n=4) argued that it would be unlikely that the method of ingestion affected the occurrence of adverse effects, as it is improbable that the difference of release would be large enough to account for this. It is more likely that perceiving differences in effect is caused by intake of food before taking a pill (Moore, Derry, Wiffen, & Straube, 2015).

The hypothesis that brain structures that underlie intelligence could also affect medication effects was rejected by the experts, because they do not believe that the medications we tested could have an (unwanted) effect on brain structures (n=4). Other experts disagree, as the working mechanisms of some drugs have not been entirely described yet. Thus, these medications could have a generalized effect (n=4). One expert expressed both views: if drugs such as paracetamol could affect the brain, these drugs could lead to differences in effect in subjects with high intelligence as opposed subjects with average intelligence.

Experts also introduced new hypotheses. Firstly, experts (n=3) found it likely that personality could play a greater role in reporting of side effects. They suggest that personality traits might lead to differences in interpretation of side effects, as they also encountered patients with average intelligence reporting increased side effects. Also, a tendency to acquire knowledge could be better ascribed to personality, as some patients were less intelligent but still curious to know more about their health. Thus, increased reporting of side effects might not be due to high intelligence, but rather due to personality traits. Furthermore, one expert suggested that acquiring knowledge could be ascribed to wanting greater control over the medication regime. Another expert supported this hypothesis, by suggesting that side effects are often disregarded when life-saving treatments are administered. These are thus other personality characteristics that might better explain why some individuals might report more side effects of treatment, but this does not necessarily have to be associated with high intelligence. Secondly, acquiring more knowledge could lead to fear and anxiety. *Herber, Gies, Schwappach, Thürmann, & Wilm (2014)* have shown that reading patient information leaflets lead to sensations of 'literally feeling ill'. Furthermore, in individuals with generalized anxiety

disorder, a higher IQ predicts for higher anxiety levels. This increase is attributed to worrying (Coplan et al., 2012). In addition, individuals with average intelligence diagnosed with depression, also report increased somatic complaints and side effects of treatment (Keeley, Smith, & Miller, 2000). Lastly, one expert suggested that individuals with high intelligence perhaps paid more attention to somatic sensations. *Barsky, Wyshak, & Klerman (1990)* coined the term somatosensory amplification (SSA): if attention is paid to somatic sensations, this could lead to amplification of these sensations. A higher SSA score increases the likelihood of interpreting bodily symptoms as medication-induced side effects (Doering et al., 2015). Individuals who have a homozygous Val158 polymorphism of catechol-o-methyltransferase (COMT) have a higher chance of acquiring a higher SSA score and reporting more nocebo effects (Wendt et al., 2014).

Online questionnaires

In Figure 1 a flow chart of the study is shown. We received a total of 78 questionnaires that were completed. Of these questionnaires, 20 questionnaires were excluded (Figure 2) based upon our inclusion and exclusion criteria (Table 1). Participants included 23 male (39,6%) and 35 female (60,3%) participants . This difference was not significant (*Student t-test*, p=0,50). IQ tests were divided among: Mensa (n=35), Cattell (n=8), WAIS (n=8), Wechsler Intelligence Scale for Children (WISC) (n=6) and Groninger (n=1). Completed level of education varied between primary (n=1), secondary (n=13), vocational (n=3), college (n=12), university (n=25) and doctorate (n=4). Mean calculated BMI (27,3) was higher in this population than in the average Dutch population (25,6; Central Bureau of Statistics (CBS) 2015). Mean length (176,6) was also higher in this population than in the average Dutch population (174,0; CBS). Further characteristics of our population can be found in Table 3.

Table 2. Expert responses to literature hypotheses.

Hypothesis	**Likely**	**n=**
It is unlikely that high intelligence is associated with genetic differences that could cause a difference in pharmacokinetics or pharmacodynamics.	+	9
Differences in personality might be a better explanation for differences in reporting of side effects than high intelligence.	+	9
Individuals with high intelligence have the tendency to look up adverse effects of a treatment before starting treatment, which is not beneficial.	+	8
As individuals look for information, this leads to thoughts and expectations. These thoughts and expectations might affect effectiveness of treatment and perceiving adverse effects as 'important' or 'dangerous'.	+	8
Female patients might report more side effects than male patients.	+	8
High intelligence could cause certain methods of ingestion to affect how adverse effects are experienced or perceived (e.g. dissolved paracetamol VS tablet paracetamol).	*	4/8
Differences in brain structure that underlie high intelligence may lead to differences in (experiencing) medication effects and adverse effects	*	3/9
As highly intelligent individuals have a higher health literacy, this could affect medication effects and adverse effects of medication.	-	8
High intelligence is related to an increase in compliance rate. Compliance affects level of medication in the blood, which could lead to an increase in adverse effects in highly intelligent individuals.	-	8
Medication could be processed in a different manner due to high intelligence.	-	9
Individuals with high intelligence might require a different dosage due to enhanced or reduced effectiveness and side effects.	-	9
High intelligence accounts for an increase in height and a decrease in BMI. Thus, individuals with high intelligence should receive changes in dosage.	-	8

Note. + = likely, * = 4 out of 8 and 3 out of 9 found the following hypothesis likely, - = unlikely. Some experts declined to comment on the likelihood of a certain hypothesis, as they found this was not their area of expertise. This explains the variation in *n*.

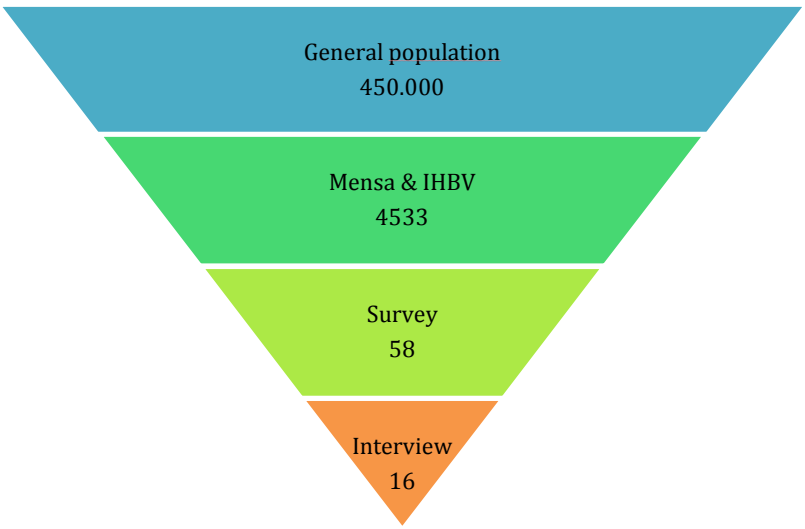

Figure 1. An illustration of an estimation of the population in The Netherlands with high intelligence, followed by our participants in online questionnaires ('Survey') and interviews.

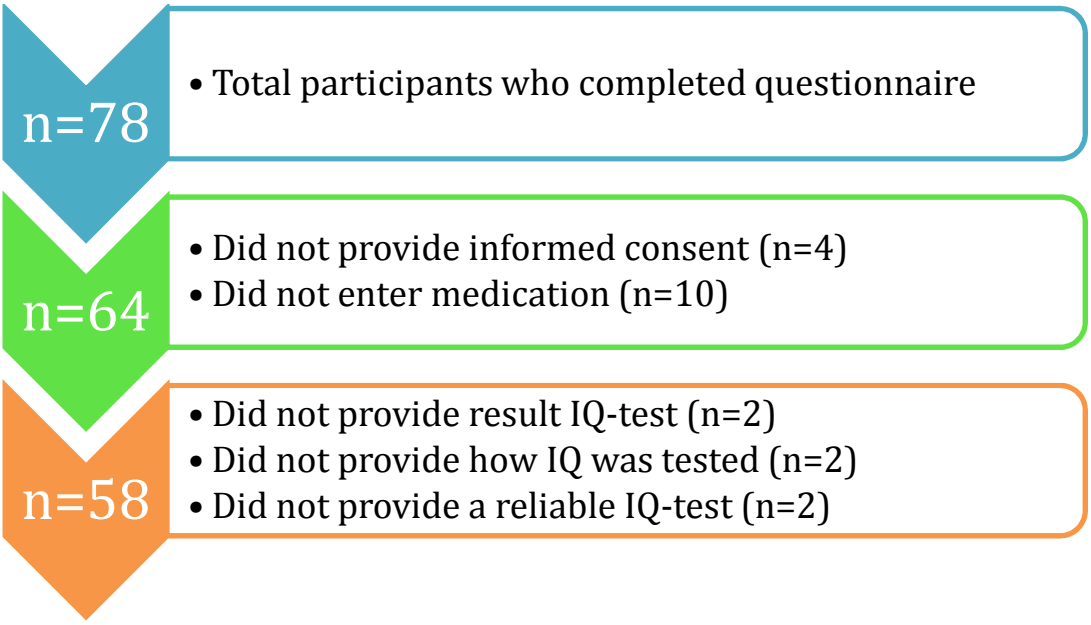

Figure 2. A flow chart of participants that remained after applying inclusion and exclusion criteria.

Table 3. Demographic characteristics of our survey population.

Age	*Mean (SD)*	*47,7 (11,68)*
	Maximum	*76*
	Minimum	*18*
	Average population	*41,5*
IQ	*Mean (SD)*	*139,6 (5,39)*
	Maximum	*175*
	Minimum	*130*
	Average population	*100*
Length	*Mean (SD)*	*176,6 (8,80)*
	Maximum	*197*
	Minimum	*158*
	Average population	*174,0*
BMI	*Mean (SD)*	*27,3 (5,28)*
	Maximum	*47,8*
	Minimum	*17,9*
	Average population	*25,6*

Note. 'Average in NL' indicates the average in The Netherlands, based on data from the Central Bureau for Statistics in 2015 (CBS).

Thirteen participants reported fourteen mild adverse effects. Reported adverse effects involved the following drugs: paracetamol (n=4), diclofenac (n=1), azelastine (n=1), mometasone (n=1), salbutamol (n=1), budesonide (n=1), formoterol/budesonide (n=1), naproxen (n=1), cetirizine (n=1), fexofenadine (n=1) and fluticasone (n=1). None of the participants reported moderate to severe adverse effects. Therefore, a chi-square analysis could not be done.

As reported earlier, mild adverse effects were spread across different drug classes, therefore it was not possible to compare effectiveness using a Mann-Whitney U analysis

between the group that did report and the group that did not report adverse effects. Thus, we cannot determine if prior expectations differed between the group that did report adverse effects and the group that did not.

Participant interviews

Ten participants were female (62,5%) and six participants were male (37,5%). Nine (56,3%) participants had answered 'yes' to the question if they believed high intelligence could influence the (perceived) effect of medication, while six answered no (43,7%).

During the interview, participants were asked whether made a distinction between high intelligence and giftedness, resulting in two separate definitions. Five participants did not make a distinction, but those that made distinctions (n=11) had different views of how high intelligence differed from giftedness. The five participants that did not make a distinction, do not believe they differ biologically from those with average intelligence to allow for other effects and (more severe) adverse effects. Eleven participants who make a distinction, can be divided into three groups. Firstly, those who believe that personality characteristics are a part of giftedness (n=5). These participants do believe they differ biologically from those with average intelligence and that this would allow for a difference in effects and severity of adverse effects. Secondly, there were individuals who believed that giftedness equates with genius or a higher IQ (n=3). Thirdly, some participants define giftedness as an IQ lower than 130 combined with aptitude in a certain discipline (n=3). The latter do not believe they differ biologically from those with average intelligence.

In addition, participants who had different beliefs, also differed in selection of sources of information. Participants who believed they differed biologically, had a tendency to use more sources that were related to foundations, organizations or patient organizations. These participants were better able to pinpoint their sources, as they reported they often used these sites. Participants who did not believe there were differences used sources that ranged from

scientific articles to pharmacy sites. These participants had more difficulty with naming examples, as they admitted their sources varied depending on the question they had.

Participants were also asked to comment on placebo and nocebo effects. Ten participants found it likely that gathering more knowledge reduced placebo effects and enhanced nocebo effects. The remaining participants (n=6) assumed that placebo effects could be enhanced as well.

Twelve participants (75%) mentioned they read the patient information leaflet before starting with the treatment. Four participants (25%) refrained from reading the part that reported possible adverse effects. These participants also reported that they often did not read patient information leaflets for common drugs (e.g. paracetamol). Two of these participants (12,5%) were medical professionals. Thus, they reported that they were not able to distinguish if they would also be more likely to read these leaflets if they had no prior knowledge. All reported that they were aware of the fact that reading patient information leaflets could have detrimental effects, e.g. the possibility of triggering nocebo effects. Yet, participants could not explain why they found it necessary to read the entire leaflet. Participants did report that they read leaflets in order to make a well-considered decision (n=4).

All participants were also asked if sensitivity to sensory stimuli could influence perceiving of adverse effects. Ten participants expressed to have heard this hypothesis before (62,5%). Five participants believed sensitivity to sensory stimuli could be associated with giftedness (31,3%). When asked for examples of high sensitivity, participants saw both being able to detect stimuli faster (lower threshold) as well as perceiving stimuli as disturbing at a lower threshold (overarousal) as components of high sensitivity. One participant reported difficulty with answering questions related to sensitivity, as the questionnaire required a combination of having a low threshold and not reporting overarousal. Yet this participant found that in some situations this could be construed as pleasant (e.g. art), while in others it was perceived as unpleasant (e.g. smell).

Discussion

In this study, literature, questionnaires and interviews were utilized to determine if high intelligence could be associated with severity and rate of reporting of adverse effects of medication. Through literature and expert interviews, it was determined that it is unlikely that neurobiological differences that underlie intelligence might also be associated with differences in medication effects. This is supported by reviews that state that both intelligence and effects of medication are multigenic and multifactorial (Deary, Penke, & Johnson, 2010; Everett, Loo, & Pullen, 2013). Furthermore, all genes accounting for heritability of intelligence have not yet been found (Zabaneh et al., 2017). Moreover, *Shakeshaft et al. (2015)* suggest that intellectual development is not caused by inheritance of genes that enhance IQ, but more so by avoiding inheritance of genes that deplete IQ. High intelligence might therefore just be a positive outcome of genetic factors that cause normal variation. This is confirmed by *Spain et al. (2015)*, who suggest that rare alleles are more often associated with low IQ, rather than high IQ. Therefore future genetic studies into genes accounting for heritability of intelligence might disprove the theory that high intelligence is associated with an increase in adverse effects of medication.

Sensitivity to sensory stimuli was suggested as a likely hypothesis, which might explain why individuals with high intelligence could report more adverse effects. It is not clear if this plays a role, as this is quite difficult to quantify. In our study, participants who report side effects do not overlap with participants who report they might be sensitive to sensory stimuli. Furthermore, it is difficult for participants to generalize if they find that being able to detect stimuli earlier (lower threshold) automatically leads to finding certain stimuli unpleasant (overarousal). Therefore, it is important to distinguish these two components of sensitivity to sensory stimuli in questionnaires. Furthermore, experts found it more likely that sensitivity and reporting of side effects were mediated by personality traits (e.g. neuroticism, Listou Grimen & Diseth, 2016) than high intelligence.

It is unlikely that difference in physique might account for a difference of effectiveness of medication in our population, as our calculated mean BMI was higher than in the average Dutch population. Mean length was also higher. Both do not warrant a change in dosage. Furthermore, one expert stated that pharmaceutical trials done on healthy volunteers often involve highly-educated people. If it can be assumed that these people were also highly intelligent, these participants would also be more likely to have a higher mean length and a lower BMI. This would mean that the dosages provided by the pharmaceutical industry have already been adjusted to dosages that individuals with high intelligence might require. Moreover, compliance rates often are high in pharmaceutical trials, which is similar in individuals with high intelligence. Also, all experts did not find that high intelligence was necessary for compliance or would lead to an increase in compliance.

Furthermore, this study showed that there is evidence for the role of nocebo effects in this population. Participant interviews demonstrated that participants do tend to read patient information leaflets. Literature search and expert interviews revealed that reading leaflets could lead to an increase of reporting. Furthermore, it has been shown that if one believes that one is sensitive to the effects and adverse effects of medication, one is more likely to report symptoms and seek information about medication (Faasse, Grey, Horne, & Petrie, 2015). Participant interviews and online questionnaires showed that participants that had the belief of being neurobiologically different, also had the tendency to use similar sources. It has been shown that people tend to consign high credibility to articles that confirm their view (Frost et al., 2015). This could lead to increase of their beliefs and expectations, and therefore might lead to enhancement of nocebo effects (Corsi & Colloca, 2017). Participants have also confirmed that they find it more likely that knowledge of medication would lead to nocebo effects. Participants also reported to be more satisfied if they were able to express their choice of treatment. *Rose, Geers, Rasinski, & Fowler (2012)* confirmed this by showing that patients are more likely to experience pain relief from a placebo, when they are able to express their choice of placebo.

Bartley, Faasse, Horne, & Petrie (2016) also demonstrated that patients are more likely to experience nocebo effects when they are not able to choose.

Lastly, it seems that a personality characteristic can tie all of these findings together. Firstly, neuroticism is linked to sensitivity to sensory stimuli and reporting of health complaints (Listou Grimen & Diseth, 2016). Secondly, neuroticism is linked to sensory amplification (Wise & Mann, 1994). Thirdly, neuroticism is linked to nocebo effects (Peciña et al., 2013). Lastly, neuroticism is linked to anxiety (Webb et al., 2012). Experts agreed that differences in personality might cause differences in frequency of reporting side effects. Furthermore, participants who used the term 'giftedness' to describe personality characteristics, also allowed for a difference in reporting of side effects.

Limitations

The current study has several limitations. Firstly, IQ was used to measure intelligence. David Wechsler stated that "although IQ is the best single measure of intelligence, it is neither the only nor a complete measure of it" (Wechsler, 1958). Furthermore, a cut-off value of 129 might be too low. This would be particularly relevant if intelligence is hypothesized to have a dose-response relationship, e.g. higher intelligence leads to more severe adverse effects. Yet, this is unlikely based on our study. In this study we found that there were participants with higher IQ scores who did not report any adverse effects, whilst their lower scoring counterparts did report adverse effects. Secondly, IQ tests were not conducted due to time constraints and only verified by asking for type of test, test result and date of testing. Therefore, IQ scores were also not comparable among participants. Thirdly, experts had not tested their IQ. Thus, this is a possible confounder. Experts could either be highly intelligent (Hauser, 2002) or averagely intelligent, therefore allowing their opinion to be biased. Moreover, only experts who were affiliated to the authors participated in interviews, allowing for bias. Furthermore, experts were interviewed in different ways, which could affect answers. Fourthly, only medication that was used during the time that the questionnaire was made available was taken into account.

Participants were not allowed to share earlier experiences due to recall bias (Patel et al., 2013). This was primarily because we only had access to full scale IQ scores, due to which we were not able to compare participants' ability to remember things from their past. Fifthly, it is likely that most participants belong to both Mensa Nederland and the IHBV. However, we were unable to determine overlap between the groups as the IHBV does not require members to register. If all members do not overlap, we managed to contact approximately 1% of the total individuals with high intelligence population in The Netherlands. Finally, we informed all participants of the aim of this questionnaire. Therefore, it is possible that participants who experienced adverse effects were more likely to participate. Furthermore, we chose participants for an interview based on their answers in the online questionnaires, allowing our results from interviews to be biased.

Strengths

As to our knowledge, this is the first study to explore associations between high intelligence and adverse effects of medication. Furthermore, this study approached this problem via multiple viewpoints using literature, expert interviews and interviews with individuals with high intelligence. In addition, this article not only explores the idea, but offers possible explanations which could account for differences in reporting of adverse effects.

In conclusion, this study shows that in the population we studied, there were no differences of moderate to severe side effects of the medications we studied between individuals with high intelligence and the average population. Yet, our study is not generalizable to other medications, specifically those affecting the brain. Furthermore, we cannot exclude the role of social modeling (Faasse et al., 2015) or social contagion (Benedetti, Durando, & Vighetti, 2014), as all individuals were affiliated to the similar organizations. Further research should be conducted to determine if our conclusion is generalizable to other medications and individuals with high IQ who are not affiliated to high IQ organizations. Further research should also be conducted to

investigate if personality characteristics plays a greater role in reporting more adverse effects than high intelligence.

References

Aron, E. N., & Aron, A. (1997). Sensory-Processing Sensitivity and Its Relation to Introversion and Emotionality. *Journal of Personality and Social Psychology Copyright*, *73*(2), 345–368.

Barsky, A. J., Wyshak, G., & Klerman, G. L. (1990). The Somatosensory Amplification Scale and its relationship to hypochondriasis. *Journal of Psychiatric Research*, *24*(4), 323–334.

Bartley, H., Faasse, K., Horne, R., & Petrie, K. J. (2016). You Can't Always Get What You Want: The Influence of Choice on Nocebo and Placebo Responding. *Annals of Behavioral Medicine*, *50*(3), 445–451.

Benedetti, F., Durando, J., & Vighetti, S. (2014). Nocebo and placebo modulation of hypobaric hypoxia headache involves the cyclooxygenase-prostaglandins pathway. *Pain*, *155*(5), 921–928.

Coplan, J. D., Hodulik, S., Mathew, S. J., Mao, X., Hof, P. R., Gorman, J. M., & Shungu, D. C. (2012). The relationship between intelligence and anxiety: An association with subcortical white matter metabolism. *Frontiers in Evolutionary Neuroscience*, *3*, 1–7.

Corsi, N., & Colloca, L. (2017). Placebo and nocebo effects: The advantage of measuring expectations and psychological factors. *Frontiers in Psychology*, *8*.

Deary, I. J., Gale, C. R., Stewart, M. C. W., Fowkes, F. G. R., Murray, G. D., Batty, G. D., & Price, J. F. (2009). Intelligence and persisting with medication for two years: Analysis in a randomised controlled trial. *Intelligence*, *37*(6), 607–612.

Deary, I. J., Penke, L., & Johnson, W. (2010). The neuroscience of human intelligence differences. *Nature Reviews Neuroscience*, *11*.

Doering, B. K., Nestoriuc, Y., Barsky, A. J., Glaesmer, H., Brähler, E., & Rief, W. (2015). Is somatosensory amplification a risk factor for an increased report of side effects? Reference data from the German general population. *Journal of Psychosomatic Research*, *79*(6), 492–

497.

Everett, J. R., Loo, R. L., & Pullen, F. S. (2013). Pharmacometabonomics and personalized medicine. *Annals of Clinical Biochemistry*, *50*(6), 523–545.

Faasse, K., Grey, A., Horne, R., & Petrie, K. J. (2015). High perceived sensitivity to medicines is associated with higher medical care utilisation, increased symptom reporting and greater information-seeking about medication. *Pharmacoepidemiology and Drug Safety*, *24*, 592–599.

Frost, P., Casey, B., Griffin, K., Raymundo, L., Farrell, C., & Carrigan, R. (2015). The Influence of Confirmation Bias on Memory and Source Monitoring. *The Journal of General Psychology*, *142*(4), 238–252.

Furmark, T., Tillfors, M., IMarteinsdottir, I., Fischer, H., Pissiota, A., Langstrom, B., & Fredrikson, M. (2002). Common changes in cerebral blood flow in patients with social phobia treated with citalopram or cognitive-behavioral therapy. *Archives of General Psychiatry*, *59*(5), 425–433.

Godwin, L., & Smith, K. (2012). Does the Normal Curve Accurately Model the Distribution of Intelligence? *2012 Ncur*. Retrieved from http://ncurproceedings.org/ojs/index.php/NCUR2012/article/view/159

Graham, S., Jiang, J., Manning, V., Nejad, A. B., Zhisheng, K., Salleh, S. R., … McKenna, P. J. (2010). IQ-related fMRI differences during cognitive set shifting. *Cerebral Cortex*, *20*(3), 641–649.

Harris, M. A., Brett, C. E., Deary, I. J., & Starr, J. M. (2016). Associations among height, body mass index and intelligence from age 11 to age 78 years. *BMC Geriatrics*, *16*(1), 1–10.

Hauser, R. M. (2002). Meritocracy, Cognitive Ability, and the Sources of Occupational Success. *CDE Working Paper*, *98–7*, 1–92.

Herber, O. R., Gies, V., Schwappach, D., Thürmann, P., & Wilm, S. (2014). Patient information leaflets: informing or frightening? A focus group study exploring patients' emotional reactions and subsequent behavior towards package leaflets of commonly prescribed medications in family practices. *BMC Family Practice*, *15*(1), 163.

Hirani, J. J., Rathod, D. A., & Vadalia, K. R. (2009). Orally Disintegrating Tablets: A Review. *Pharm Res Tropical Journal of Pharmaceutical Research Trop J Pharm Res*, *8*(82), 161–161.

Jagiellowicz, J., Xu, X., Aron, A., Aron, E., Cao, G., Feng, T., & Weng, X. (2011). The trait of sensory processing sensitivity and neural responses to changes in visual scenes. *Social Cognitive and Affective Neuroscience*, *6*(1), 38–47.

Keeley, R., Smith, M., & Miller, J. (2000). Somatoform symptoms and treatment nonadherence in depressed family medicine outpatients. *Archives of Family Medicine*, *9*, 46–54.

Khalili-Mahani, N., van Osch, M. J., de Rooij, M., Beckmann, C. F., van Buchem, M. A., Dahan, A., … Rombouts, S. A. R. B. (2014). Spatial heterogeneity of the relation between resting-state connectivity and blood flow: An important consideration for pharmacological studies. *Human Brain Mapping*, *35*(3), 929–942.

Lawlor, D. A., Clark, H., Davey Smith, G., & Leon, D. A. (2006). Childhood intelligence, educational attainment and adult body mass index: findings from a prospective cohort and within sibling-pairs analysis. *International Journal of Obesity (2005)*, *30*, 1758–1765.

Listou Grimen, H., & Diseth, A. (2016). Sensory Processing Sensitivity: Factors of the Highly Sensitive Person Scale and Their relationships to Personality and Subjective Health Complaints. *Perceptual and Motor Skills*, *123*(3), 637–653.

Moore, R. A., Derry, S., Wiffen, P. J., & Straube, S. (2015). Effects of food on pharmacokinetics of immediate release oral formulations of aspirin, dipyrone, paracetamol and NSAIDs - A systematic review. *British Journal of Clinical Pharmacology*, *80*(3), 381–388.

Mõttus, R., Johnson, W., Murray, C., Wolf, M. S., Starr, J. M., & Deary, I. J. (2014). Towards understanding the links between health literacy and physical health. *Health Psychology : Official Journal of the Division of Health Psychology, American Psychological Association*, *33*(2), 164–73.

Mrazik, M., & Dombrowski, S. C. (2010). The Neurobiological Foundations of Giftedness. *Roeper Review*, *32*(4), 224–234.

Patel, M., Perrin, K., Pritchard, A., Williams, M., Wijesinghe, M., Weatherall, M., & Beasley, R.

(2013). Accuracy of patient self-report as a measure of inhaled asthma medication use. *Respirology*, *18*(3), 546–552.

Patel, T., Blyth, J. C., Griffiths, G., Kelly, D., & Talcott, J. B. (2014). Moderate relationships between NAA and cognitive ability in healthy adults: implications for cognitive spectroscopy. *Frontiers in Human Neuroscience*, *8*, 39.

Peciña, M., Azhar, H., Love, T. M., Lu, T., Fredrickson, B. L., Stohler, C. S., & Zubieta, J.-K. (2013). Personality Trait Predictors of Placebo Analgesia and Neurobiological Correlates. *Neuropsychopharmacology*, *38*(4), 639–646.

Peerdeman, K. J., van Laarhoven, A. I. M., Keij, S. M., Vase, L., Rovers, M. M., Peters, M. L., & Evers, A. W. M. (2016). Relieving patients' pain with expectation interventions. *Pain*, *157*(6), 1179–91.

Petersen, G. L., Finnerup, N. B., Colloca, L., Amanzio, M., Price, D. D., Jensen, T. S., & Vase, L. (2014). The magnitude of nocebo effects in pain: A meta-analysis. *Pain*, *155*(8), 1426–1434.

Rose, J. P., Geers, A. L., Rasinski, H. M., & Fowler, S. L. (2012). Choice and placebo expectation effects in the context of pain analgesia. *Journal of Behavioral Medicine*, *35*(4), 462–470.

Schultz, D. H., & Cole, M. W. (2016). Higher Intelligence Is Associated with Less Task-Related Brain Network Reconfiguration. *Journal of Neuroscience*, *36*(33), 8551–8561.

Serper, M., Patzer, R. E., Curtis, L. M., Smith, S. G., O'Conor, R., Baker, D. W., & Wolf, M. S. (2014). Health literacy, cognitive ability, and functional health status among older adults. *Health Services Research*, *49*(4), 1249–1267.

Shakeshaft, N. G., Trzaskowski, M., McMillan, A., Krapohl, E., Simpson, M. A., Reichenberg, A., … Plomin, R. (2015). Thinking positively: The genetics of high intelligence. *Intelligence*, *48*, 123–132.

Spain, S. L., Pedroso, I., Kadeva, N., Miller, M. B., Iacono, W. G., McGue, M., … Simpson, M. A. (2015). A genome-wide analysis of putative functional and exonic variation associated with extremely high intelligence. *Molecular Psychiatry*, *21*, 1–7.

Takeuchi, H., Taki, Y., Hashizume, H., Sassa, Y., Nagase, T., Nouchi, R., & Kawashima, R. (2011).

Cerebral blood flow during rest associates with general intelligence and creativity. *PLoS ONE*, *6*(9), 4–12.

Wechsler D (1958). The Measurement and Appraisal of Adult Intelligence. Baltimore, Maryland: Waverly Press, Inc.

Vuoksimaa, E., Panizzon, M. S., Chen, C. H., Fiecas, M., Eyler, L. T., Fennema-Notestine, C., … Kremen, W. S. (2016). Is bigger always better? The importance of cortical configuration with respect to cognitive ability. *NeuroImage*, *129*, 356–366.

Webb, J. T., Amend, E. R., Webb, N. E., Goerss, J., Beljan, P., Olenchak, F. R. (2005). Misdiagnosis and dual diagnoses of gifted children and adults. Tucson, Arizona: Great Potential Press, Inc.

Wendt, L., Albring, A., Benson, S., Engler, H., Engler, A., Hinney, A., … Schedlowski, M. (2014). Catechol-O-methyltransferase Val158Met polymorphism is associated with somatosensory amplification and nocebo responses. *PLoS ONE*, *9*(9).

Wise, T. N., & Mann, L. S. (1994). The relationship between somatosensory amplification, alexithymia, and neuroticism. *Journal of Psychosomatic Research*, *38*(6), 515–521.

Zabaneh, D., Krapohl, E., Simpson, M. A., Miller, M. B., Iacono, W. G., McGue, M., … Breen, G. (2017). Fine mapping genetic associations between the HLA region and extremely high intelligence. *Scientific Reports*, *7*, 1–8.

Appendix A: Preliminary online questionnaire

1. Welke medicatie slikt u? In de kader van dit onderzoek verstaan wij onder medicatie middelen die u bij de drogist kunt halen zoals paracetamol, aspirine en middelen die door de arts voorgeschreven worden. Vitamines (tenzij deze zijn voorgeschreven door de arts) en complementaire behandelwijzen, bijvoorbeeld orthomoleculair geneeskunde en homeopathie, vallen in de kader van dit onderzoek niet onder medicatie.

a.

b.

…

2. Hoe vaak slikt u deze medicatie?

a.

b.

…

3. Sinds wanneer slikt u deze medicatie?

a.

b.

…

4. Een paar vragen over uw IQ:

a. kunt u aangeven hoe hoog dit is in een exact getal of range?

b. welke IQ-test u hiervoor gedaan heeft?

c. wanneer u deze IQ-test gedaan heeft?

5. Zou u mee willen doen aan fase twee? U kunt dan hieronder ja of nee invullen. Zo ja, dan kunt u hier ook uw mailadres invullen.

Appendix A: Online questionnaire

1. Wat is uw voornaam?
2. Wat is uw achternaam?
3. Wat is uw geslacht?
4. Wat is uw leeftijd?
5. Hoe heet uw laatst verrichte IQ test?
6. Hoe hoog was uw IQ volgens die test?
7. Wanneer heeft u deze IQ test afgelegd?
8. Wat is de hoogst genoten opleiding die u met een diploma heeft afgesloten?
9. Kunt u hierbij aangeven wat het beste bij u past met betrekking tot:

i. Ras (oorspronkelijk uit Europa, Afrika, Azië, VS, Australië – onder VS en Australië verstaan wij Native Americans en Aboriginals),

ii. Cultuur (meerkeuze Westers, Africoïd, Aziatisch)?

10. Hoe lang bent u?
11. Hoeveel weegt u?
12. Wat voor werk doet u?
13. Hoe verwerft u in het algemeen informatie over medicatie?
14. Welk(e) van de eerder genoemde middelen gebruikt u?
15. Hoeveel van dit middel gebruikt u op dit moment?
16. Hoe vaak gebruikt u dit middel?
17. Vergeet u soms wel eens het middel te gebruiken?

a. Zo ja, kunt u toelichten hoe vaak u vergeet het middel te gebruiken?

18. Wat doet u als u vergeet het middel te gebruiken?
19. Merkt u het als u vergeet het middel te gebruiken?

a. Zo ja, kunt u toelichten wat uw ervaring is als u het middel vergeet te gebruiken?

20. Waar heeft u instructies voor gebruik van afgeleid of gekregen?
21. Hoe gebruikt u het middel?
22. Is dit naar uw idee de juiste manier?
23. Hoe bent u op deze manier gekomen?
24. Heeft u het wel eens op een andere manier geprobeerd?
25. Hoe bent u aan het middel gekomen?

a. Indien voorgeschreven,

i. kunt u toelichten of u de adviezen van de arts opvolgt?

ii. wat heeft de arts u over het middel verteld?

iii. had u van tevoren verwacht dat de arts dit voor zou schrijven?

26. Zou u dit middel ook aan anderen aanraden?

27. Vindt u dat u voldoende informatie had (gekregen) over het middel voordat u het moest gebruiken?

a. Zou u daarbij kunnen toelichten waarom u dit vindt?

28. Wat weet u over het middel? Kunt u hierbij toelichten wat u weet over (zonder dit op te zoeken):

a. hoe het werkt (eigenschappen)

b. wanneer het wordt ingenomen of voorgeschreven (indicatie)

c. wanneer het niet gebruikt mag worden (contra-indicatie)

d. welke dosis gebruikelijk is voor de klacht die u ervaart (dosering)

e. wat er kan gebeuren als u teveel slikt van het middel (overdosering)

f. welke bijwerkingen u kunt ervaren

g. hoe groot de kans is dat iemand van de algemene bevolking deze bijwerkingen ervaart

i. waar baseert u dit op?

h. welke tekenen er zijn dat u met het middel moet stoppen (waarschuwingen en voorzorgen)

i. welke middelen er invloed op kunnen hebben (interacties)

29. Hoe kwam u aan informatie over het middel?

30. Wat vindt u van het middel?

31. Wat vindt u ervan dat de arts dit middel heeft voorgeschreven? (op een schaal van 1-10: 1=onlogisch, 10=passend)

32. Wat merkt u als u het middel heeft ingenomen?

33. Zou u per effect kunnen beschrijven:

a. Wat u ervaart?

b. Wanneer het voorkomt (bijvoorbeeld 15 minuten na inname van het middel)?

c. Hoe vaak het voorkomt? (op een schaal van zeer zelden (L), zelden, af en toe, vaak, zeer vaak (R))

d. Wat u eraan heeft gedaan om het te verhelpen of verminderen (behalve stoppen met inname van het middel)?

e. Of het veranderd is in de tijd? Zo ja, kunt u aangeven:

i. Wat u vroeger ervaarde?

ii. Hoe storend waren deze effecten (op een schaal van 1-10: 1 = niet merkbaar, 10 = zo storend dat u met het middel wilt stoppen)?

iii. Wat u nu ervaart?

iv. Hoe storend zijn deze effecten (op een schaal van 1-10: 1 = niet merkbaar, 10 = zo storend dat u met het middel wilt stoppen)?

v. Waarom de ernst, naar uw mening, veranderd is?

34. Wat het effect op de klacht is op een schaal van 1-10: 1 = geen effect, 10 = veel effect.
35. Hoe bent u erachter gekomen dat het een effect is van het middel?
36. Wat zijn uw gedachten als u een effect van het middel ervaart?
37. Ervaart u gedachten die het probleem erger maken dan het is ('Mijn pijn is zo erg, het kan nooit meer beter worden.')? Kunt u toelichten wat voor gedachten u heeft?
38. Heeft u het gevoel dat u zich op de ervaringen van effecten concentreert en erover peinst? Kunt u hierbij toelichten waarom u dat vindt?
39. Heeft u controle over deze gedachten over effecten? Kunt u hierbij toelichten waarom u dat vindt?
40. Heeft u hierdoor meer of minder van het middel nodig heeft dan de dosering voorgeschreven door de arts of beschreven in de bijsluiter?
41. Past u zelf de dosis aan? (0= helemaal niet, 1= in lichte mate, 2= in zekere mate, 3= in grote mate, 4= altijd)
42. Waarom kiest u ervoor zelf de dosis aan te passen?
43. Maakt u ook aanpassingen in overleg met de arts?
44. Ervaart u altijd hetzelfde gevoel bij gebruik van het middel? Indien u een ander effect ervaart, zou u dit toe kunnen lichten?
45. Ervaart u bijwerkingen? Zo ja, kunt u (per bijwerking) beschrijven:

a. Wat u ervaart?
b. Wanneer het voorkomt (bijvoorbeeld 15 minuten na inname van het middel)?
c. Hoe vaak het voorkomt? (op een schaal van zeer zelden (L), zelden, af en toe, vaak, zeer vaak (R))
d. Wat u eraan heeft gedaan om het te verhelpen of verminderen (behalve stoppen met inname van het middel)?
e. Of het veranderd is in de tijd? Zo ja, kunt u aangeven:

i. Wat u vroeger ervaarde?
ii. Hoe ernstig waren deze bijwerkingen (op een schaal van 1-10: 1 = niet merkbaar, 10 = zo storend dat u met het middel wilt stoppen)?
iii. Wat u nu ervaart?
iv. Hoe ernstig zijn deze bijwerkingen (op een schaal van 1-10: 1 = niet merkbaar, 10 = zo storend dat u met het middel wilt stoppen)?
v. Waarom de ernst, naar uw mening, veranderd is?

46. Hoe bent u erachter gekomen dat het een bijwerking is van het middel?
47. Wat zijn uw gedachten als u bijwerkingen ervaart?
48. Ervaart u gedachten die het probleem erger maken dan het is ('Mijn pijn is zo erg, het kan nooit meer beter worden.')? Kunt u toelichten wat voor gedachten u heeft?

49. Heeft u het gevoel dat u zich op de ervaringen van bijwerkingen concentreert en erover peinst? Kunt u hierbij toelichten waarom u dat vindt?
50. Heeft u controle over deze gedachten over bijwerkingen? Kunt u hierbij toelichten waarom u dat vindt?
51. In hoeverre accepteert u de nadelen van dit middel ten gunste van de werking van het middel? (op 1 tot 5: 1= ik accepteer de nadelen helemaal niet, 3 = ik vind dat de nadelen en de werking gelijk staan, 5= ik accepteer de nadelen geheel)
52. Zou u een alternatief middel kunnen gebruiken?
53. Wat is uw idee met betrekking tot hoe hoge intelligentie effect zou kunnen hebben op medicatie?
54. Hoe bent u op dit idee gekomen?
55. Op welke medicatie heeft hoge intelligentie een effect?
56. Hoe zou intelligentie tot een verandering in effect of bijwerkingen kunnen leiden? Wij zouden het op prijs stellen als u hierbij bronnen zou kunnen vermelden, als dat van toepassing is.
57. Zou u vervolgvragen willen beantwoorden in een interview? Zo ja, dan kunt u hier uw mailadres en telefoonnummer invullen**.**

Appendix B: Questionnaire interview with experts

Wij doen onderzoek naar hoge intelligentie en medicatie. Het betreft hierbij de effecten en bijwerkingen die mensen met hoge intelligentie door medicatie zouden ervaren.

- Wat vindt u van een link tussen hoge intelligentie en medicatie?*

- Wat zou u als argumenten voor en tegen kunnen geven?
- Heeft u wetenschappelijk bewijs om dit te onderbouwen?
- Kent u iemand die zich hierin heeft verdiept (expert op dit gebied)?

*Als experts meer toelichting willen: mensen met hoge intelligentie geven aan dat zij anders reageren op medicatie ervaren dan mensen met een gemiddelde intelligentie. Dit betreft meer of minder effect van een middel of meer bijwerkingen door een middel. Wat vindt u hiervan**?**

Appendix B: Questionnaire interview with participants

- Wat verstaat u onder hoge intelligentie?
  - Denkt u dat uw hersenen anders zijn (centraal)?
  - Denkt u dat uw lichaam anders is (systemisch)?
  - Ziet u uw fysieke klachten losstaan van uw intelligentie?
- Maakt u een onderscheid tussen hoge intelligentie en hoogbegaafdheid?
  - Zo ja, wat is het verschil?
  - Waar vindt u zichzelf het beste bij passen?
- U gaf aan dat u op zoek gaat naar informatie over medicatie. Waarom vindt u dit nodig?
  - Wat gebeurt er als u geen informatie over het middel heeft?
  - Heeft u wel eens geprobeerd het middel in te nemen zonder er vooraf informatie over te verwerven?
  - Zo ja, hoe ervaarde u dat?
- Hoe is uw relatie met uw arts?
  - Kunt u alles bespreken met uw arts?
  - Heeft u het gevoel dat u serieus genomen wordt door uw arts?
  - Mag u meebeslissen over hoe uw ziekte zal worden behandeld?
- U had aangegeven dat het middel een <goed/slecht> effect heeft op uw klacht.
  - Heeft u de dosering besproken met uw arts?
- Wat verstaat u onder het placebo effect?
  - U gaf aan dat u meer/minder het placebo effect zou kunnen ervaren. Kunt u dit toelichten?
- Sommige mensen hebben de indruk dat mensen met hoge intelligentie heftiger reageren

op medicatie dan andere mensen.

- Heeft u ook dit gevoel?
- Hoe heeft u dit vastgesteld?
- Hoe vaak denkt u hierover?
- Praat u vaak met mensen hierover?
- Zijn er andere mensen in uw omgeving die hetzelfde ervaren?

• Heeft u het idee dat u door medicatie de grip op uw denkprocessen verliest?

- Waarom is belangrijk voor u dat u te allen tijde grip heeft op uw denkprocessen?

• Heeft u het gevoel dat u een lagere drempel heeft dan andere mensen voor het waarnemen?

- Hoe heeft u dit vastgesteld?

• Er zijn deelnemers aan dit onderzoek die hebben aangegeven dat hoog intelligente mensen emotie en verstand goed kunnen onderscheiden.

- Heeft u ook dit idee?
- Hoe bent u op het idee gekomen?
- Hoe heeft u dit vastgesteld?
- Heeft u dit eerder met andere mensen besproken?
- Zijn er andere mensen in uw omgeving die hetzelfde ervaren?

Vragenlijst Interview (Hoge intelligentie geen invloed)

• Wat verstaat u onder hoge intelligentie?

- Denkt u dat uw hersenen anders zijn (centraal)?
- Denkt u dat uw lichaam anders is (systemisch)?
- Ziet u uw fysieke klachten losstaan van uw intelligentie?

• Maakt u een onderscheid tussen hoge intelligentie en hoogbegaafdheid?

- Zo ja, wat is het verschil?
- Waar vindt u zichzelf het beste bij passen?

• U gaf aan dat u op zoek gaat naar informatie over medicatie. Waarom vindt u dit nodig?

- Wat gebeurt er als u geen informatie over het middel heeft?
- Heeft u wel eens geprobeerd het middel in te nemen zonder er vooraf informatie over te verwerven?
- Zo ja, hoe ervaarde u dat?

• Hoe is uw relatie met uw arts?

- Kunt u alles bespreken met uw arts?
- Heeft u het gevoel dat u serieus genomen wordt door uw arts?
- Mag u meebeslissen over hoe uw ziekte zal worden behandeld?

• U had aangegeven dat het middel een <goed/slecht> effect heeft op uw klacht.

- Heeft u de dosering besproken met uw arts?
- Wat verstaat u onder het placebo effect?
- Denkt u dat intelligentie een invloed zou kunnen hebben op dit effect?
- Zo ja, hoe zou intelligentie het placebo effect kunnen beïnvloeden?
- Sommige mensen hebben de indruk dat mensen met hoge intelligentie heftiger reageren op medicatie dan andere mensen.
- Heeft u ook dit gevoel?
- Hoe heeft u dit vastgesteld?
- Hoe vaak denkt u hierover na?
- Praat u vaak met mensen hierover?
- Zijn er andere mensen in uw omgeving die hetzelfde ervaren?
- Heeft u het idee dat u door medicatie de grip op uw denkprocessen verliest?
- Waarom is belangrijk voor u dat u te allen tijde grip heeft op uw denkprocessen?
- Heeft u het gevoel dat u een lagere drempel heeft dan andere mensen voor het waarnemen?
- Hoe heeft u dit vastgesteld?
- Er zijn deelnemers aan dit onderzoek die hebben aangegeven dat hoog intelligente mensen emotie en verstand goed kunnen onderscheiden.
- Heeft u ook dit idee?
- Hoe bent u op het idee gekomen?
- Hoe heeft u dit vastgesteld?
- Heeft u dit eerder met andere mensen besproken?
- Zijn er andere mensen in uw omgeving die hetzelfde ervaren?