Genetica®

# G-ADHD

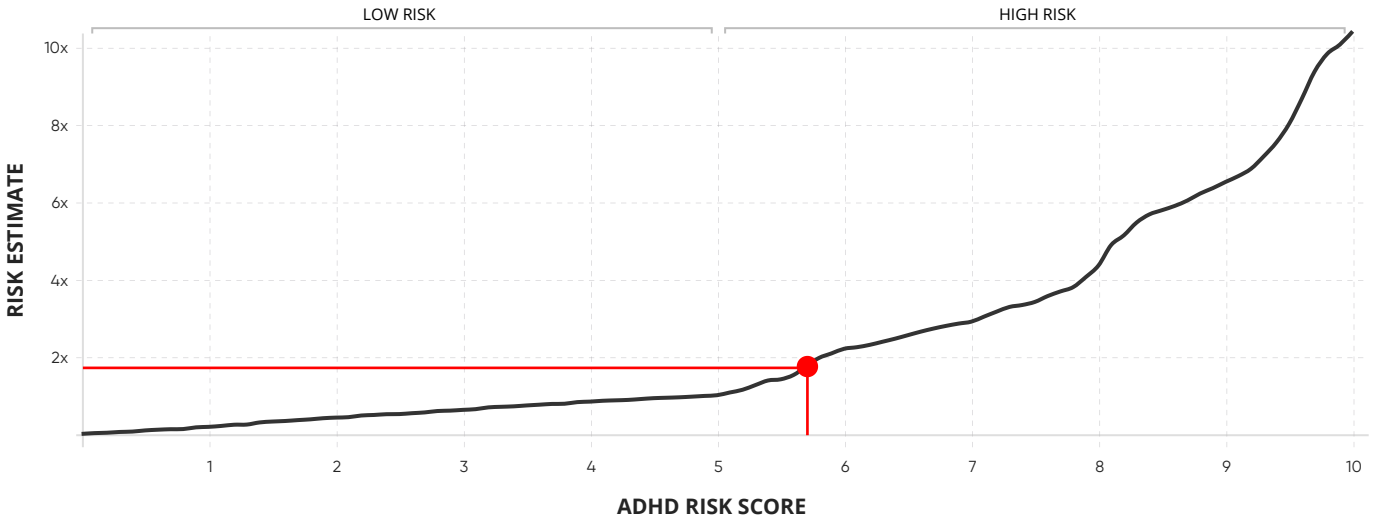
## Hereditary ADHD Risk Screening

Explore Your Genes
Define Your Future

www.genetica.asia

| FOR | | TEST INFO | |
|---|---|---|---|
| **User** | **Nguyễn Thị B** | **Genetica ID** | QWERTY12345 |
| **DOB** | 11 November 2011 | **Specimen** | Saliva |
| **Gender** | F | **Received** | N/A |

# RESULT




- **ADHD RISK SCORE: 5.7**/10
- **RISK ESTIMATE**: The individual's risk of ADHD is 1.74x.
- 2165 variants associated with ADHD were found in the individual's genome. Among them are:
  - **0 protective variants**
  - **0 pathogenic variants**
  - **5 harmful variants**

| Gene | Location | Value | Effect | Status | Impact |
|---|---|---|---|---|---|
| **COMT** | 19963748 | **GG** NC_000022.11:g.19963748 | High | Harmful | Slightly higher risk of ADHD, possibly linked to the lower level of dopamine transporter density |
| **EREG** | 74358873 | **TC** NC_000004.12:74358872 | High | Harmful | Higher risk of acting without thinking given a defect in epiregulin development gene |
| **SNAP25** | 10296804 | **AC** NC_000020.11:g.10296804 | High | Harmful | Significantly associated with both parent-and teacher-reported symptoms of inattention behavior |
| **ZNF544** | 58259517 | **AG** NC_000019.10:58259516 | High | Harmful | Higher risk to have attention deficit, potentially due to a defect in the ZNF544 gene |
| **SNAP25** | 10306436 | **TT** NC_000020.11:g.10306436 | High | Harmful | Susceptible to have strong inattentiveness, might be linked to a lack of dopamine release |

*(To view the full list of ADHD associated variants, download the Genetica mobile app from App Store or Google Play.)*

**User** : Nguyễn Thị B
**DOB**: 11 November 2011
**Genetica ID**: QWERTY12345
**Gender**: Female

# PATHOGENIC MUTATION

- **NEGATIVE:** 0 pathogenic mutations detected in the individual's genome.

NOTE: Having 0 pathogenic mutations does NOT completely eliminate the individual's risk of ADHD. Environmental factors, as well as other nonpathogenic genetic variants, also affect a person's risk of ADHD.

# RECOMMENDATIONS

- We have spotted a mutation in your child's dopamine-processing gene, the COMT gene. This mutation is linked to lower levels of dopamine transporter density, a risk indicator of ADHD. However, children with this mutation also have a better prognosis.

  - The COMT gene instructs the body to produce an enzyme called catechol-O-methyltransferase. This enzyme helps the body break down dopamine, a type of neurotransmitter (brain messenger). The dopamine is broken down in the part of the brain nearest your forehead, called the frontal cortex. Both the frontal cortex and dopamine play a role in the ability to pay attention. Specifically, numerous research found an associate that a low level of dopamine contributes to attention-deficit/hyperactivity disorder (ADHD).

  - Findings from family-, twin- and adoption-studies indicate that the heritability of ADHD is around 70–80%, with environmental risk factors accounting for nearly 20–30% of the variance in ADHD symptoms. Your child has a very specific mutation in the COMT gene. This mutation makes the COMT enzyme 3-4 times more active than other people's. When the enzyme is more active, the amount of dopamine in the brain decreases. As mentioned before, lower levels of dopamine therein are tied to ADHD.

  - For children who carry your child's COMT mutation, the good news is that those children have better prognosis. That's because the mutation that your child carries is associated with better treatment outcomes than other mutations linked to ADHD. Moreover, researchers have found that children with this mutation tend to have a less severe form of ADHD than children with alternate mutations.

  - Researchers posit that Asian children may be less likely to have ADHD compared to other groups because of environmental factors, like traditional family norms, which protect against ADHD. However, Asian families may be less likely to recognize, or admit to their child having, ADHD as a result of possible stigma or discretion. The latter scenario may be very harmful to a child's long term development if proper diagnosis and care is avoided as a result. It is highly recommended that children who carry ADHD-associated mutation should be properly evaluated for ADHD by a doctor.

- We've discovered a mutation in your child's EREG, brain development, gene. This mutation raises her risk of ADHD and its consequences, like acting without thinking.

  - Epiregulin is a small, protein-like, hormone that's encoded by the EREG gene. Your child carries a mutation in the EREG gene that is associated with a higher risk of ADHD. It's not entirely clear why this gene or hormone affects a person's chances of having ADHD. Nevertheless, scientists at least understand that EREG appears to affect the development of the brain in newborns. That probably causes a child to act without thinking as a result.

  - If you observe other symptoms of attention deficit hyperactivity disorder, you should discuss with your child's pediatrician about doing everything you can to ensure that your child's brain develops properly as she ages. For example, certain nutrients are more important for the development of the brain than others. This includes, but isn't limited to, choline and copper.

  - If you notice your child acts without thinking so regularly, she may need professional counseling. What you can try at home at first is pointing out the instances when she does think before acting, praising her when that happens. At the same time, point out the instances when she acts without thinking, and why it's wrong, as she may not even notice otherwise. In the end, professional behavioral therapy, often combined with medication, is the true mainstay treatment of ADHD.

- Your child carries a mutation in the SNAP25 gene, a brain messenger gene, that is linked to a higher chance of ADHD-related inattention. Children carrying this mutation are often reported by their parents and teachers regarding inattention behavior.

- Our brain cells release chemical messengers in order to communicate with one another. These chemical messengers are found within balloon-like structures, called vesicles, within the brain cells themselves. In order for these chemical messengers to be released, the vesicles must dock and fuse with the brain cell's membrane. Once the chemical messengers are released, they can affect a person's behavior and attention.

- The process of docking and fusion is partly influenced by the SNAP25 gene. Studies have shown that mutations in this gene lead to an uncontrolled and unpredictable release of chemical messengers from selected areas of the brain. These areas of the brain are related to the signs and symptoms of ADHD.

- Your child has a mutation in this gene that is linked to ADHD. Specifically, teachers have reported many elements of ADHD, such as inattention, hyperactivity, and impulsivity, in children with this mutation. This can be damaging to the child-teacher relationship. In Asia, teachers are afforded great respect. Research has shown that when a teacher is interrupted, embarrassed, or challenged by a child with ADHD, they feel shame and inadequacy.

- Scientists hypothesize that, as a result of mutations such as the one in your child's DNA, some medications may work better than others in the treatment of ADHD. Methylphenidate is one of the most popular medication for ADHD but research has shown it is effective for some particular genetic variations. While this remains to be proven, do note that there are plenty of other ADHD medications that may help children with ADHD, namely Dexamfetamine, Lisdexamfetamine, Atomoxetine or Guanfacine.

- Research in Asian children has shown that medications such as these can actually increase a child's IQ score. However, this shouldn't be seen as the medication actually increasing IQ itself. Rather, it's more likely that the medication helps treat the ADHD in a way that permits the child to reach her full—natural—potential that is otherwise hindered by this condition. By no means should these medications be used to try and boost a child's IQ if she doesn't have ADHD, as this won't work.

- Your child has a mutation in her ZNF544 gene, which may negatively affect the cerebral cortex, the outer portion of the brain. This mutation is linked to a higher risk of having attention deficit.

  - One of the key indicators of ADHD is an abnormal structure to the cerebral cortex. In children with this condition, the cerebral cortex is about 8% smaller than normal. gene regulates the creation of numerous protein molecules, which can theoretically influence the structure and function of the cerebral cortex. We have discovered that your child carries a mutation in her ZNF544 gene. This mutation is linked to a higher risk of having attention deficit.

  - This might occur because, in children with ADHD, the right-front portion of the cerebral cortex has weaker-than-normal "circuitry". In other words, the connections between the brain cells in this part of the brain are either sparse, slow, or poorly developed. This is problematic because this part of the brain is responsible for regulating impulsivity. Along with this, consider that Asian children may be underdiagnosed more often, particularly compared with children in the U.S. Make sure to speak with your child's pediatrician if you have a suspicion that she has attention deficit.

  - For children with ADHD, a combination of medication and therapy often works best in treating this consider. Medications include atomoxetine and methylphenidate. Therapy includes psychoeducation, which helps children make sense of their condition. In addition, a growing body of evidence shows that aerobic exercise can improve a child's attention and behavioral control. Moreover, exercise can boost the number of connections between brain cells as well as the speed at which they communicate with one another.

- Your child has a mutation in a gene that may regulate the release of dopamine. This mutation is linked to a higher risk of ADHD and, therefore, inattentiveness.

- Neurotransmitters are chemical messengers that neurons (brain cells) use to send signals to one another and, therefore, influence a person's behavior, attention, emotions, and thinking. The SNAP25 gene regulates the process of releasing one of the important neurotransmitters, namely dopamine. Recent research has shown us that harmful mutations in this gene lead to an abnormal release of dopamine, that is linked to higher risk of ADHD.

- Your child carries a mutation in the SNAP25 gene that is associated with a higher risk of ADHD. Specifically, research in Asian children has found that kids with this mutation may have problems with attention. Researchers hypothesize that this mutation is linked to lower levels of the SNAP25 protein and, therefore, a smaller release of neurotransmitters called catecholamines, including dopamine. Dopamine is a neurotransmitter that is widely believed to play an important part in ADHD and attention.

- A lack of dopamine release can be countered by medications for ADHD, like methylphenidate. Methylphenidate is a prescription drug that increases the concentration of dopamine in the spaces brains cells use to communicate with one another. Children carrying this mutation should be diagnosed for ADHD by doctors. Based on the diagnostic result, pediatrician can prescribe medications that can help counter the potential, genetically-caused, lack of dopamine in the child's case.

## GENES ANALYZED

*54 genes associated with ADHD were analyzed.*

ADRA1A, ALDOA, ATP2A1, BBS4, BCAT1, BCL9, BCORL1, BCR, BDNF, BLK, BRCA2, BTD, BUB1, CDK20, CHAF1B, CHAT, CIDEA, CLCN3, CLIC2, COL1A1, CSPP1, CTNS, CUL3, FGFR3, FLG, FOXP1, FSCN1, GALC, GCNT2, GLDC, GNB5, GPC3, GPHN, HOXD1, PCK1, PRKN, PTEN, PUDP, RASGRP1, RECQL4, RGS1MTR, RNF168, RTEL1, SCN1A, SCN8A, SETBP1, SHH, TSSK2, TUSC3, TXNRD2, WWOX, ZBTB20, ZFHX4, OTC.

## ELECTRONICALLY SIGNED BY

**Duyen Bui**, PhD, CSO & Lab Director
*on 31 December 2020 at 11:02:39*

**Rama Kota**, PhD, Lead Geneticist
*on 31 December 2020 at 10:02:39*

## What is ADHD?

ADHD stands for attention-deficit/hyperactivity disorder. It is a type of neurodevelopmental condition that affects about 6% of kids.

This condition, often first diagnosed in children, is divided into three major categories:

- The largely "inattentive" type of ADHD. This is when the child is easily distracted, disorganized, and forgetful.
- The predominantly "hyperactive-impulsive" form of ADHD. Here, children frequently fidget, talk a lot, and may act before they think.
- The combined form of ADHD, which represents an equal mix of the inattentive and hyperactive-impulsive forms of ADHD.

Critically, the type of ADHD is not stagnant. In other words, it's relatively common for children to transition from one type of ADHD to another over their lifetime.

Research shows that children with an Asian background are less likely to have ADHD, either as a result of under-diagnosis or protective cultural factors.

## How does ADHD affect learning?

ADHD is strongly linked to poor academic performance and learning. Children with this condition often get lower grades, are more likely to fail a class, and less likely to finish school.

Specifically, a child's inability to sustain attention can cause them to miss important instructions for their assignments or to daydream during a class. The hyperactive elements of this disorder may result in the disruption of the entire class with inappropriate physical or verbal distractions. Furthermore, the impulsivity seen in ADHD can lead to carelessness when responding to questions in class, disobedience to the teacher, or incomplete homework assignments.

In Asian countries, a further dynamic may be present, as respect towards authority figures is often of utmost importance. Asian teachers have reported feeling shame or offense at the actions exhibited by children with ADHD, which may further strain the classroom learning experience.

## Does ADHD have any lasting effect on adults?

At least 30-40% of children with ADHD will continue to have the condition as an adult. In fact, roughly 0.1% - 3% of Asian adults have ADHD, depending on the country in question.

Irrespective of origin, grown men and women with ADHD may have problems finishing reports at work, reading through lengthy financial and legal documents, or completing a detailed medical history form.

Moreover, adults with ADHD often feel restless and tire others out with their constant activity. Worst of all, undiagnosed or untreated ADHD may negatively affect an adult's work performance and personal relationships.

## How do genes affect ADHD?

At least 12 specific regions of DNA have provided relatively robust evidence for the risk of ADHD. Generally speaking, 70-80% of the risk of ADHD is determined by genetic factors such as these, a risk that's higher than most other psychiatric disorders. Specifically, about 20% of this risk is caused by tiny mutations in the genetic code, called SNPs, which change one "letter" of the code into another.

Moreover, there are a few genes involved in the risk of ADHD that may significantly affect the Asian population. This includes the LPHN3 gene, which influences the key regions of the brain that are involved in ADHD. These regions include the cerebral cortex, the thin outer layer of the brain that regulates attention.

Plenty of other genes have been implicated in the risk of ADHD, however. This includes genes that affect the dopamine and serotonin (chemical messenger) systems of our brain, systems that manage attention and impulsivity.

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**User** : Nguyễn Thị B
**DOB**: 11 November 2011
**Genetica ID**: QWERTY12345
**Gender**: Female

# DISCLAIMER

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Gene Friend Way's role is limited to providing results of genetic test and providing a broad set of general recommendations. More detailed recommendations that may be specific to you are to be made by qualified Professional Practitioners only. General guidelines provided in our report are for information purpose only and are meant to aid your Professional Practitioner to render the relevant professional or medical advice and treatment. While assessing your genetic parameters and providing the report and recommendations, we do not consider your past or existing health conditions and or any medication taken by you (either in the past or currently), even if you may have provided us with such information. Our report and the recommendations therein are to be acted upon in consultation with a medical or other health and wellness professional practitioner.

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# Other services from Genetica®

65 genes

## G-Care

**Foundation To Your Quality Life**

Over 18 years of age

**NutriCare**
- Carbohydrate metabolism
- Protein metabolism
- Fat metabolism

**Facts-to-Know**
- Béo bụng
- Chuyển hóa affeine
- Nguy cơ mất ngủ

**HealthCare**
- Breast Cancer or Prostate Cancer
- Stomach Cancer
- Asian Flush

**Personality**
- Belly fat
- Caffeine sensitivity
- Insomnia tendency

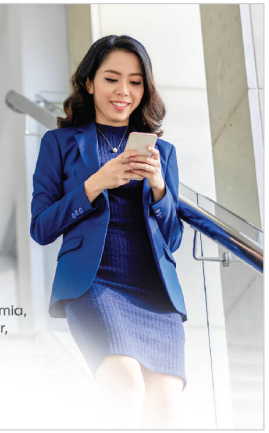
**PhysiCare**
- Endurance ability
- Power performance
- Cardiorespiratory fitness

300 genes

## G-Pro

**Unearth Your Potentials**

Over 18 years of age



**Mind & Spirit**
- Personality
- Behavior tendency
- Cognitive ability
- IQ, EQ
- Educational attainment
- Language ability
- Math ability
- Music ability

**Nutrition**
- Protein, Fat, Carbohydrate metabolism
- Vitamin requirements
- Liver Detoxification
- Food and Drink sensitivities
- Eating behavior
- Cardiometabolic risk
- Diabetes risk scores
- Cardiometabolic health

**Fitness**
- Endurance ability
- Power performance
- Cardiorespiratory fitness
- Recover ability
- Tendency to get injuries
- Weight Management Difficulty
- Tendon/ Ligament strength
- Exercise benefit

**Resting**
- Insomnia tendency
- Belly fat
- Caffein metabolism

**Health**

**Up to 20 common cancers for both genders**
- Breast, Bladder, Brain, Cervical,
- Colorectal, Colon, Esophageal,
- Uterine, Kidney, Stomach, Leukemia,
- Liver, Lung, Pancreatic, Testicular,
- Prostate, Ovarian, Skin
- Pheochromocytoma and
- Paraganglioma

125 genes

## G-Kid Care

**Foundation For Child's Development**

From 0 to 18 years of age

**Behavioural tendencies**
- Extraversion
- Conscientiousness
- Emotional instability

**Macronutrient metabolism**
- Carbohydrate metabolism
- Fat metabolism
- Protein metabolism

**Health risk**
- Obesity risk score

**Intelligence**
- IQ
- EQ
- Cognitive ability

300 genes

## G-Kid Pro

**Reaching An Optimal Future**

From 0 to 18 years of age

**Mind**
- IQ
- EQ
- Educational attainment
- Cognitive ability
- Math ability
- Language ability
- Music ability
- Fitness potentials

**Body**
- Vitamin requirement
- Mineral requirement
- Macronutrients requirement
- Eating behavior
- Sweet and bitter taste
- Health risk: Obesity Cardiometabolic/ Diabetes risk.

**Spirit**
- Personality
- Behavior tendency

# Other services from Genetica®

97 genes

## G-Health

**Access Risk Of Hereditary Diseases**

Over 18 years of age

**Up to 20 common cancers for both genders**

- Breast
- Bladder
- Brain
- Cervical
- Colorectal
- Colon
- Esophageal
- Uterine
- Kidney
- Stomach
- Leukemia
- Liver
- Lung
- Pancreatic
- Testicular
- Prostate
- Ovarian
- Pheochromocytoma
- and Paraganglioma
- Skin

48 genes

## G-Autism

**Hereditary Autism Risk Screening**

**The G-Autism report will unveil the genetic risk of an individual via:**
- Detect any known pathogenic or likely pathogenic mutations associated with ASD.
- Evaluate the Autism Risk Score: A polygenic score which indicates the user's increased risk of autism.

**Everyone will benefit from this report. However, young children who display symptoms of autism are especially advised to take the genetic test.**

**This report will provide you:**
- In-depth knowledge about gene-related causes of ASD.
- Information that enables best-suited personalized therapy and developmental care in regard to the user's risk of autism.

32 genes

## G-Immunity

**Hereditary Susceptibility To Respiratory Viral Infection Screening**

**Traits tested:**
- SARS-CoV
- Influenza
- Acute Respiratory Distress Syndrome (ARDS)

**Everyone will benefit from this report.**

**Benefits:**
- Provide users the genetic information about their susceptibility to viral infection.
- Mainly focusing on respiratory viral infections at this time.
- Provide actionable guidelines and recommendations based on research studies from epidemics that have happened, such a SARS epidemic, .....

73 genes

## G-Stroke

**Hereditary Stroke Screening**

**The G-Stroke report will provide the following information:**
- Pathogenic or likely pathogenic mutations that increase risk of strokes (ischemic stroke, hemorrhagic stroke).
- Stroke Risk Score: a polygenic score that indicates the patient's increased risk of stroke.

**Everyone will benefit from this report.**

**Benefits:**
- In-depth knowledge about gene-related causes of stroke.
- Information to make informed medical and lifestyle decisions in regard to the user's risk of stroke.
- Personalized recommendations for preventive and monitoring options.

Thank you,

It is our honor to be able to contribute
to your healthy and happy life.

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