Are early interventions for autism effective?

page **02**

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RÉSEAU NATIONAL **D'EXPERTISE** EN TR☉UBLE DU SPECTRE DE **L'AUTISME**

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CHAIRE DE RECHERCHE MARCEL ET ROLANDE GOSSELIN EN NEUROSCIENCES COGNITIVES FONDAMENTALES ET APPLIQUÉES DU SPECTRE AUTISTIQUE

Sur le spectre:

Proud to announce that *Sur le Spectre's* new YouTube channel was launched in January.

It is once again with great pleasure that we present the 11th issue of Sur le Spectre, our scientific outreach magazine. This spring issue, prepared during the autism awareness month, is once again made possible thanks to the collaboration of the authors and members of our writing committee who write and revise articles on a voluntary basis. We also thank our financial partners: the Marcel Rolande Gosselin Research Chair in Cognitive Neuroscience and Autism, the Réseau National d'Expertise en TSA (RNETSA), the Petits Trésors Foundation and the CIUSSS-NIM Research center.

We are very proud to announce that *Sur le Spectre*'s new YouTube channel was launched in January, and that a first video, available in French and English, was created and published online. This first video was made possible thanks to the Fond de Recherche du Québec en Santé, via the DIALOGUE grant, aimed at promoting science outreach to the community and to the general public. We encourage you to subscribe to our channel, which will help us secure more funding and create more outreach videos of our articles, making scientific research in autism even more accessible.

In this issue, you will find an article part of our *FAQ: research* series about animal models in science, and in autism research specifically. You will also find an article summarizing findings from a recent meta-analysis on early intervention efficacy in autism, as well as an article on a case study, recently conducted and published by our research group. Finally, you will also find an article written by a young autistic researcher describing her academic and research experience as it relates to autism in particular, and an article describing a new questionnaire developed in Dr. Claudine Jacques' lab to measure interest and strengths in autistic children.

Happy reading!

Valérie Courchesne Ph.D.

Chief editor

We encourage you to subscribe to our channel, which will help us secure more funding and create more outreach videos of our articles, making scientific research in autism even more accessible.

The researchers
focused exclusively
on non-medicinal
interventions for
autistic children
between 0 and
8 years of age.

Are early interventions for autism effective?

By VALÉRIE COURCHESNE and LAURENT MOTTRON

A meta-analysis on the efficacy of early intervention for autistic children was recently published in the high impact journal *Psychological Bulletin*. These results have a tremendous importance for decision making in the clinical and political spheres concerning autism. The researchers focused exclusively on non-medicinal interventions for autistic children between 0 and 8 years of age. Seven different types of early interventions were analysed[1]:

1 Behavioral interventions
(ex : EIBI, PECS, DTT)

2 Developmental interventions
(ex : DIR, floortime, Hanen)

3 Naturalistic developmental behavioral intervention (NDBI)
(ex : ESDM, PVT, JASPER)

4 Treatment and Education of Autistic and Communication Handicapped Children (TEACCH)

5 Sensory interventions

6 Zootherapy

7 Technology-based interventions

The different intervention targets were grouped in 15 categories. These targets could involve core autism characteristics such as social communication or stereotypic behaviors, or could also be outside these core characteristics, such as language, playing behaviors, adaptive functioning or problematic behaviors.

A **meta-analysis** is a scientific study that combines and analyzes results from multiple studies conducted on the same topic. The studies included in a meta-analysis must satisfy predetermined quality criteria and are subject to inclusion and exclusion criteria, such as participants' age. Researchers can then analyse all the studies at once and draw conclusions from these studies' results in a meta-analysis.

Taken from 130 different groups of autistic children, for a total of 6240 participants, Sandbank and colleagues extracted 1615 intervention change *effect sizes* from early intervention studies. The size of the effect indicated how much change occurred after the intervention. After having arranged these effects to make them comparable, they were able to interpret them, while accounting for research study quality. Authors also conducted moderation analyses, which looks at other factors that may influence the relation between the cause (intervention) and the effect (change measured). In this case, the authors wanted to know whether the effects (the change) attributed to the intervention could be explained by the similarity between the intervention target and the intervention type or by the similarity between the intervention setting and the setting in which the intervention change was measured.

For example, if the intervention specifically trains the child's joint attention during a construction game with blocks and then measures the effectiveness of this intervention by measuring changes in joint attention or changes in joint attention in this same construction game context, it is possible that the proximity between the intervention and the variable measured is responsible for the change observed. In contrast, if joint attention is trained with the assumption that this function must be mastered in order to acquire language, and then the effectiveness of the intervention on language progress is measured, this explanation cannot be invoked.

An **effect size** is a statistical index that estimates the importance of a difference that is found in a research study. For example, if a difference in language skills is found in a group of autistic children that received an intervention compared to a group of autistic children that did not receive it, the effect size allows us to measure how big this difference is.

The authors made 3 important conclusions based on their evaluation of intervention efficacy.

The authors wanted to know whether the effects (the change) attributed to the intervention could be explained by the similarity between the intervention target and the intervention type or by the similarity between the intervention setting and the setting in which the intervention change was measured.

1. To learn more about the included interventions, we encourage you to read the original article. The examples provided are not exhaustive and are meant to help the readers identify some of the interventions they might be familiar with.

![Sur le spectre]

Conclusion 1 : If the quality of studies is not considered, 3 of the 7 types of interventions are effective. These include the behavioral interventions, developmental interventions, and the NDBI.

Conclusion 2 : If only the randomized controlled trials are considered, the NDBI interventions are the only interventions deemed effective. The same conclusion is made when the authors **exclude studies in which parents were the ones rating an intervention's effectiveness**. Asking a parent to judge the intervention's effectiveness introduces a possible bias as parents know that the child received the intervention.

Original Article:
Sandbank, M., Bottema-Beutel, K., Crowley, S., Cassidy, M., Dunham, K., Feldman, J. I., ... & Woynaroski, T. G. (2020). Project AIM: Autism intervention meta-analysis for studies of young children. *Psychological Bulletin*, 146(1), 1.

Conclusion 3 : When the quality criteria are combined, meaning that only randomized controlled trials and studies using non-biased measures for change are considered, there was **NO effective intervention for any of the 15 analysed intervention targets!**

Randomized controlled trials are used to measure an intervention's effectiveness. This study design involves random distribution of participants to an intervention group or a control group (no intervention). These two groups are then compared, once the intervention group receives the intervention. Randomized controlled trials are the gold standard method in any medical study that examines a treatment's efficacy. This design ensures that possible sources of bias are minimized. For example, the person in charge of measuring the treatment's efficacy (the change) is not aware of the treatment condition of any participant (treatment group or placebo). This person should also be neutral toward the intervention's effectiveness (no interest in whether it works, have nothing to gain from it such as recognition or money).

The authors from this meta-analysis conclude that the NDBI could be a promising type of intervention to support autistic children's developmental abilities but that they lack conclusive scientific and evidence-based data. They invite parents and clinicians to be cautious when reading research findings from different intervention studies in autism.

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Adolescence, autism and calendar calculation:

a case study.

By VÉRONIQUE LANGLOIS

Special abilities and strengths in autistic individuals have been the subject of research for almost a hundred years now. For a long time, it was thought that special abilities were limited to only a handful of exceptional individuals with autism. We now know that a majority of autistic people show heightened abilities – a relative ability peak[1] – in one domain or more. These special abilities, along with intense interests, have been regarded as unimportant or detrimental to autistic individuals' functioning and well-being. The last 20 years have been marked with a change of perspective in research, where special abilities are now considered as useful and essential for their well-being.

Media portrayal of autistic abilities in different movies or television series have shaped the public's opinion and views on autism. These portrayals – based on real but rare cases of exceptionally talented individuals – positively modified views on autism, while creating unrealistically high expectations of autistic strengths and abilities.

It can be tempting to draw conclusions concerning a person's learning abilities, daily functioning or general intelligence based on the presence of a special ability. As a majority of cognitive tests have been known to underestimate the abilities of autistic individuals, the idea that one particular ability could imply underlying preserved intellectual abilities is appealing. Navigating expectations relating to special abilities and their meaning in autism can therefore be difficult.

To better understand the specific challenges faced by individuals with autism that have special abilities, a team of researchers and clinicians studied C.A.'s abilities. Researchers were also interested in his family's expectations and hopes for his future, as relating to his special ability. C.A. was a 13-year-old teenager with a special ability for calendar calculations. Specifically, he was able to easily identify the correct day of the week when given a date on a calendar.

These portrayals – based on real but rare cases of exceptionally talented individuals

1. We invite you to read the article Autism Explained in 10 numbers in the last issue of Sur le spectre for more information about absolute and relative peaks of abilities.

> In that respect, abilities and strengths can be developed but general cognitive profile must be taken into account to set realistic expectations and goals and ensure the experience is a positive one for the individual.

Original article:
Courchesne, V., Langlois, V., Gregoire, P., St-Denis, A., Bouvet, L., Ostrolenk, A., & Mottron, L. (2020). Interests and Strengths in Autism, Useful but Misunderstood: A Pragmatic Case-Study. *Frontiers in Psychology*, 11, 2691.

Evaluation

A multidisciplinary evaluation was initially conducted with C.A. This included documenting his developmental history, evaluating his intelligence, language, autonomy, social life at school and at home, performing a psychiatric examination and documenting his strengths and interests.

His parents counted on C.A.'s special ability and its underlying strengths to facilitate his school participation, and eventually, his workplace inclusion. His parents had high expectations and thought his general potential and abilities were just waiting to be developed. These high expectations were associated with signs of anxiety and depressive moods for C.A. His evaluation revealed he had a relative ability peak in non-verbal reasoning, as commonly reported in autism. Namely, he was better at a task requiring him to complete a logical sequence of images, compared to tasks measuring his working memory, visuospatial abilities or his information processing speed. Whereas his performance in non-verbal reasoning was in the average range for his age, his performance on other abilities were lower than expected at his age. CA had important language difficulties :speaking as well as understanding oral and written language. These difficulties were substantial enough to warrant the need for a language disorder diagnosis. His language difficulties caused problems for evaluating his general abilities, as well as for his educational learning in school. He also had a low level of autonomy compared to other boys his age.

His evaluation showed that in addition to being interested in video games, watching humor or rap videos on YouTube, and Lego, he also had an interest in music, geography and biographical and movie release dates.

Identifying melodies and movies after hearing the first notes or sounds of the soundtrack, spatial orientation, calendar calculations and date memorizations were C.A.'s strengths as reported by his parents and himself. His calendar calculation abilities were tested systematically using past and future calendar dates. His score showed he performed better than average on this test, as most individuals are not able to calculate calendar days. C.A. mentioned that his strategy for his calendar calculations was based on prior movie release dates (Fridays in Québec). However, when compared to worldwide calendar experts, his abilities were considered modest.

Intervention

Following C.A.'s multidisciplinary evaluation, the team determined several intervention objectives: develop emotion regulation skills, make adjustments to his daily activities so they are in line with his strengths and interests, develop autonomy, and align his perception and his parents' perceptions concerning his abilities with his actual strengths and weaknesses. C.A. and his family had access to a year of clinical follow ups. These included psychiatric consultations, as well as an individual psychotherapy combined with parental coaching with a psychoeducator.

Although it may not lead to C.A obtaining his high school degree or to developing a career path, the school adaptations and the multidisciplinary follow ups allowed him to continue his education at his own pace. Having a better understanding of his particular challenges helped C.A. and his parents shape new and realistic expectations. For C.A., pursuing his own academic goals corresponded well with his interest in knowledge acquisition and contributed to fostering positive self-esteem.

What can we learn from this study?

Special abilities (strengths) can present themselves regardless of the level of intellectual functioning. That being said, a person's achievements in their area of expertise are often related to, or limited to, their general functioning. In that respect, abilities and strengths can be developed but general cognitive profile must be taken into account to set realistic expectations and goals and ensure the experience is a positive one for the individual.

This study also demonstrated how high expectations based on a special ability can trigger anxiety, frustration, low self-esteem or tensed relationships (at home or at school), and general disappointment towards different services. Special abilities may not lead to better academic performance or career opportunities but can contribute to a person's well-being and quality of life, are they are associated with positive emotions and can also bolster self-esteem.

Conclusion

Autistic strengths or interests appear to be independent of their direct utility in everyday life, whether in the present or in the future. Engaging in activities that a person enjoys and that allow a person to feel competent and valued can be beneficial for the person's self-esteem. Encouraging someone in the pursuit of their interest should therefore be done without any particular expectation, other than for the well-being or the sense of pride it provides, which is beneficial to their mental health.

INTERVIEW SUR LE SPECTRE

NOÉMIE CUSSON, a neuropsychology doctoral student at Université du Québec à Montréal
Interviewed by JANIE DEGRÉ-PELLETIER.

The many faces of autism research.

The profile of a future autistic researcher.

Noémie Cusson
a neuropsychology doctoral student at Université du Québec à Montréal

Biography

Noémie completed a bachelor's degree (Honours) in cognitive neuroscience at Université de Montréal, under the supervision of Dr. Laurent Mottron (M.D., Ph.D.). She was then accepted in the research stream of the neuropsychology doctoral program at Université du Québec à Montréal, which she is currently completing under the supervision of Drs. Isabelle Soulières and Laurent Mottron. Noémie's research interests include social cognition and cognitive strengths in autism.

What does the neuropsychology doctoral program look like?

Essentially, the neuropsychology doctoral program offers three different streams focusing on : (1) clinical neuropsychology, (2), research, and (3) clinical neuropsychology and research respectively three different profiles, that is one profile focused on clinical neuropsychology, one profile focused on research and one profile that combines both clinical neuropsychology and research. At Université du Québec à Montréal, the clinical and research streams can be completed within 4 to 5 years whereas the stream that combines both clinical and research training lasts 6 years. The training streams that have a clinical component lead to the profession of neuropsychologist (a specialization title that is recognized by the Ordre des psychologues du Québec) whereas the training streams that have a research component lead to the Ph.D. title allowing one to become a researcher and potentially a university professor. Therefore, the classes that are offered are more oriented towards either clinical neuropsychology or research. For example, there are some neuropsychological assessment and intervention classes,

> I wish to put forward the idea that autism is not a disease, but simply a different way of perceiving the world around us.

but also research methodology and quantitative or qualitative analysis classes. Depending on the chosen stream, students also need to complete internships either in a clinical setting or in a research laboratory.

Noémie, what brought you to the autism research world?

I became interested in autism after receiving an autism diagnosis at the age of 17. I began reading on this subject (on which I knew very little!) and, having always been interested in research, decided to specialize in this field. I never regretted my choice. Indeed, I quickly realized that I really like autism research. What I like most about research is that it can lead to new discoveries and to the development of new theories, which can in turn contribute to helping other people. I particularly like the moment when, after having collected all my data, I can start data analysis and see what the data will reveal to me. Furthermore, as researchers, we never stop learning new things and one of my interests is precisely acquiring new knowledge.

As I became more familiar with the autism research world, I realized that there were not many autistic researchers in this field. Further, by reviewing the scientific literature, I sometimes had the feeling that alternative interpretations could be brought forward to explain results. Thus, I believe that it is an advantage as an autistic researcher to be able to combine, in my research projects, my explicit knowledge (acquired through my readings) and my implicit knowledge (acquired through my personal experience) about autism.

What career goals do you hope to achieve?

Getting my diagnosis literally changed my life and allowed me to understand myself better. Thus, one of my goals as a future autism researcher is to improve the understanding that the general population, professionals, and researchers have of autism and to help demystify this condition. As such, I believe that it is very important to clearly communicate my research results to the general population, and to disseminate results in lay language and make them accessible to as many people as possible. I also hope that my research projects will contribute to improving autistic people's quality of life. Finally, I wish to put forward the idea that autism is not a disease, but simply a different way of perceiving the

world around us. Thus, although autism is linked to some difficulties, it can also be associated to several strengths on which we can capitalize!

Which autism research projects are you currently working on?

For my Honour thesis, I conducted a literature review on empathy in autism and my results suggested that autistic people <u>feel</u> other people's emotions as much as neurotypical people (affective empathy). However, they seem to have more difficulties <u>understanding</u> other people's emotions (cognitive empathy). Furthermore, from my Honour's thesis research, we concluded that the method chosen to measure empathy seems to have a major impact on the studies' conclusions. Therefore, I am currently working on a meta-analysis on this subject to validate these results.

I am also involved in other projects. More specifically, I am collaborating on a project that aims to reconceptualize "restricted" interests in autism under the viewpoint of passions and to better understand the consequences that these passions have on autistic people's functioning. This project will highlight the adaptative aspects of autistic people's passions and may help them develop harmonious passions, which are linked to several positive consequences including better quality of life. I am also working on a project that looks at how clinicians diagnose adult autistic women and how they distinguish autism from other psychiatric conditions. This project's results may help clinicians less familiar with autism to better understand how autism manifests itself in adult women.

Concluding remarks

I would like to finish by saying that I am convinced that research can truly have a beneficial impact on the population that we study if it meets a need of that population. Thus, I believe that it is important to involve autistic people in all the steps of the research process, and this includes involving them in the early stages such as priority setting and methodology as early as for the choice of the subject and the methodology. Including autistic people in future research projects would add an interesting perspective as much to the development of the project as to the interpretation of the results and would lead to a better understanding of autism!

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Development of a questionnaire on strengths and interests in autism.

By AGNÈS ETHIER and KATARINA SOTELO

Research

By rating their children's abilities and their own, parents also enjoyed realizing how many strengths they shared. Generally

Autistic children's intense interests (e.g.: numbers, letters, dinosaurs, cars, falling objects) make up a significant part of their everyday lives. The importance of these interests has been a subject of debate. Recent studies show that intense interests in autism are associated with wellbeing and the development of different abilities. Documenting these interests, along with their associated strengths, is typically done with the help of parents. However, until recently, no standardized measure could reliably document and assess the development of special strengths and interests in autistic children.

To address this gap, the Questionnaire on Autistic Preschoolers' Strengths and Interests (QAPSI) was developed. As an initial step, a review of existing research articles on strengths and interests of autistic and typical children was conducted. This led to the development of a preliminary version of the questionnaire. Then, professional experts in autism and parents of young

children with autism reviewed the questionnaire, with a back-and-forth revision process. Including both professionals and parents in this process is important and considered essential for the development of an assessment measure meant for parents of autistic children. Their collaboration allows the integration of both professional and experiential knowledge in the development of a specialized measure that is well adapted to its users.

This new questionnaire is easily completed as it includes 19 questions and takes from 20 to 30 minutes to fill out. The QAPSI documents children's as well as parents' strengths and interests. This questionnaire has closed-ended questions, to which parents can answer with a Likert-type scale (i.e.: from "no interest" to "intense interest"; or from "do not agree at all" to "completely agree") and open-ended questions allowing for details and additional information concerning main interests, for example.

The questionnaire's final version was pilot-tested with 27 parents of young autistic children and 28 parents of typical children aged 2 to 6 years. Parents from both groups confirmed the questionnaire's value and relevance. By rating their children's abilities and their own, parents also enjoyed realizing how many strengths they shared. Generally, parents of autistic children rated their children's strengths and interests less positively compared to parents of typical children. Yet, parents of autistic children also expressed their desire to embrace autistic interests and strengths. For example, one parent mentioned: "**the questionnaire allowed me to see things other than my children's deficits**".

Additionally, the questionnaire highlighted important differences between the two groups of children. Unsurprisingly, autistic children's interests were rated as being more intense compared to typical children's interests. Five interest domains were significantly more frequent in autistic children: 1) logos; 2) numbers; 3) letters; 4) electronics; 5) pipes, whereas the following three domains were more popular with typical children: 1) playing with friends; 2) make-believe play; 3) reading books.

Parents from 10 different autistic children reported literacy (letters/numbers/books) as being their child's main interest, 8 reported electronic devices, 2 dolls/ plushies, and others reported interests in other objects or activities such as watching television, dinosaurs, coloring books, water, cars, Legos or fans. Parents also reported that their autistic child's interest for literacy

was used to recognize, write, copy or identify different letters and numbers. Letters were used for observing books and numbers were placed in ascending or descending order or were used to count: "*She can count up to 100 in French, English, and Romanian. She memorizes words and can recognize them.*". Results also show that interests tend to intensify and diversity with time, as children grow older: "*His interest in numbers has intensified. He writes them, draws them, groups them, places them, makes constructions and tells stories with numbers. He is very creative*"; "*His interest in letters and numbers has grown and he has gotten even better.*". These results indicate that these children's growing interest in literacy has led them to develop new knowledge and skills. Future intervention strategies could be developed around children's interests and eventually promote the development of abilities.

Three strengths were significantly more common in children with autism: shapes, embedded games or toys, and playing around with a screen. For example, when talking about construction blocks, a parent mentioned: "*My child stacks them together in a line but in a complex manner. For example, piles become larger, and he can make more columns.*". Another parent commented about his child's strengths: "*He uses magnetic letters, but he also uses letters made out of wood, foam, plastic, he can also make words and associations...he uses anything he sees in his environment.*"

To summarize, the findings show how important it is to take into account the strengths and interests of autistic children. Ultimately, this questionnaire will allow parents to identify and assess their child's strengths and interests and will help researchers understand how strengths and interests are connected. Moreover, this questionnaire promotes the inclusion of parents in their child's evaluation process, by encouraging professionals and parents to collaborate.

Being the first instrument that will allow us to document autistic children's strengths and interests from their parents' perspective, the QAPSI could bring forward a better understanding of these autistic traits, and of the way these contribute to learning and the development of new abilities in some cases. With the QAPSI, a detailed individualized profile of strengths and interests will go hand in hand with promoting new interventions that are tailored specifically to every child. This assessment can also prove useful for parents, who will be able to use these strengths and interest profiles to apply new techniques or adapt home routines. Using the strength and interest profile and integrating it to daily living could foster a good quality of life for the entire family and greater sense of wellbeing.


Using the strength and interest profile and integrating it to daily living could foster a good quality of life for the entire family and greater sense of wellbeing.

Original article:
Larose, V., Sotelo, K., Mottron, L., & Jacques, C. (2021). Initial Development of a Questionnaire About Parents' Perspectives on the Strengths and Interests of Autistic Preschoolers. *Canadian Journal of Behavioural Science.*

# PARENTS DE JEUNES FILLES ET GARÇONS AUTISTES RECHERCHÉS
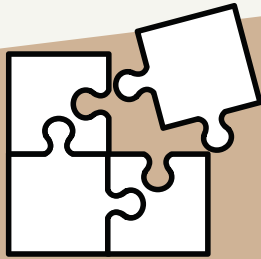
Dans le cadre de mon mémoire de maîtrise en psychoéducation à l'UQO, je suis à la recherche de parents de filles et garçons autistes âgés de 24 à 72 mois afin de documenter leurs forces et leurs intérêts à l'aide du nouveau Questionnaire sur les forces et les intérêts des enfants autistes d'âge préscolaire (QFIAP).

La participation à cette recherche consiste à remplir un questionnaire en ligne.

Pour participer à cette étude, les parents doivent :

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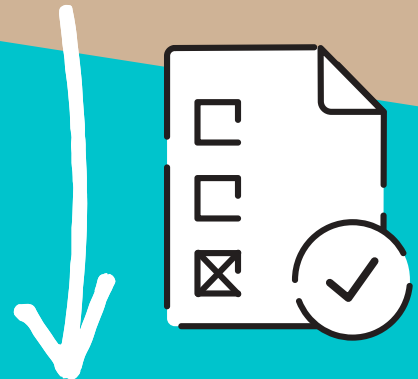
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Ariane Charbonneau,
Étudiante à la maitrise en psychoéducation

Ce projet de recherche est sous la supervision de Claudine Jacques, Ph.D. ps.ed., professeure au Département de psychoéducation et en psychologie de l'UQO. Le projet a reçu l'approbation du Comité d'éthique de la recherche de l'UQO.
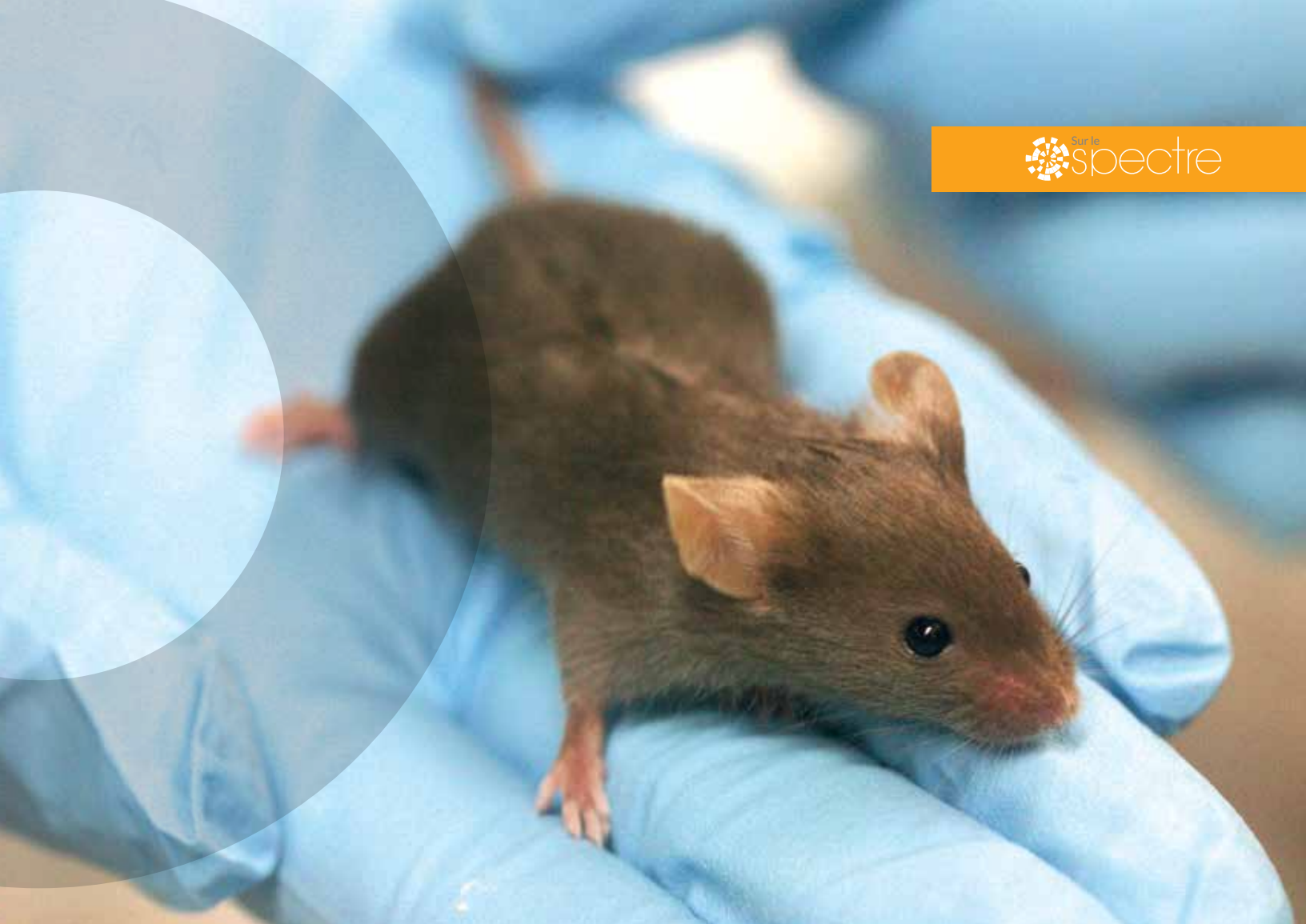
Science FAQ:

Animal models.

By **ALEXA MEILLEUR**

What is an animal model?

Animal models are animals that are used in the context of scientific research. These can bring a better understanding of complex situations affecting humans, such as infections and genetic mutations. Many different species have helped researchers elucidate important scientific questions. Animal models have contributed to some of the greatest scientific discoveries in the last hundred years, benefiting human beings' health outcomes.

Nobel Prizes awarded to research using animal models: Transmission and treatment of tuberculosis (1905), Discovery of Insulin (1923), Discovery of Penicillin (1945), Development of in vitro fertilization (2010)[1].

Drawing conclusions about human functioning and development from an animal is not so easily done. That being said, it's been done successfully with several animals. Mice, rats, and monkeys share from 85% to 96% of our genetic baggage, which allows researchers to make important medical advances and unravel the mysteries of the human body. Although these animals' brains are markedly different, particularly their size, many basic brain functions can be successfully investigated. In medical and neuroscience experiments, researchers can look at the effects of a chemical agent, an environmental stress, or a gene on the development of an animal.

1. Understanding animal research. (2020, 1er Octobre). *Nobel Prize.* Animalresearch.info. http://www.animalresearch.info/en/medical-advances/nobel-prizes/

Regardless of the chosen animal model, we must stay cautious with the interpretation of findings from animal research

There are many advantages to using animal models:

1. They allow researchers to devise experiments that wouldn't be practical or ethical with human beings. For example, causing a genetic mutation would be reprehensible in human studies. However, with genetic modifications, animal models can shed light on many illnesses like diabetes and cancer.

2. Some human conditions are extremely rare. Thus, recruitment of research participants is very difficult as participants are hard to find. In contrast, with animal models, many participants can be available at once, which would be impossible, costly, and time consuming in human research.

3. Finally, animal research is usually faster than human research since the life cycle of certain species is shorter than that of humans. Notably, a mouse reaches its adult stage between the ages of 50 and 70 days.

Autism and animal models

The mouse is the most frequently used animal model in medical research as well as autism research. The first autism animal models, developed in the early 2000s, were not very precise. They attempted to reproduce conditions that were known to be associated with autism at the time: a viral infection or exposure to valproic acid during pregnancy. Creating these situations in a mouse enabled researchers to study the mouse's development and draw conclusions concerning autism. However, we now know these situations can only explain a small portion of autism cases in the population.

With the discovery of different genes associated with autism, new animal models were developed. Genetic methods were used to change a mouse's genetic baggage and create genetic characteristics that were observed in autistic individuals. Genes like the CNTNAP2, the CHD8, and the SHANK3 were removed from the genetic baggage or altered in mice. The mice models were considered to be genetically analogous to autism in humans.

Once these genetic models were created, researchers studied these mice for any hints of autistic behaviors such as altered social communication. Observable behaviors, like sniffing other mice or making sounds to communicate, were absent from these genetically modified mice. Repetitive behaviors, such as compulsively digging up rocks or jumping and fidgeting were also identified in those "autistic" mice. Different tests were developed to study these behaviors in mice.

One example is the three-chamber test. This test places the mouse in a space with three separate areas, with one of these areas holding a mouse in a small cage. Researchers measure how much time the free mouse spends with the caged mouse as a proxy for social behaviors. The more the free mouse is drawn to the caged mouse, the more sociable she is deemed to be.

What conclusions can be drawn from these animal models?

Given autism is a genetically complex and heterogeneous condition, there are currently no mice models that can genetically replicate it. Despite the relevance of animal models for autism research, one genetic mutation like the SHANK3, for example, only accounts for 1% of autism cases. Moreover, researchers are only able to establish the genetic cause of autism in 20% of cases, and the genes involved are often numerous. Animal research relating to autism must therefore be interpreted with caution, as only a minority of genetic mutations can be reproduced.

Although humans share a large amount of genes with other animals, they hold specific and unique genetic markers that determine when and how our genes are expressed. This means that we have biological indices which regulate our DNA's genetic expression. This way, the same genes in humans will not be expressed the same way as they would in other species.

Ultimately, animals have their own way of communicating and socializing, making it challenging for researchers to draw conclusions on human behavior based on animal models. Is our understanding of animal communication substantial enough to allow us to draw conclusions on a condition like autism? According to some researchers, studying social communication in a species like the mouse could be problematic because their social functioning is markedly different from humans'. Other animals, like the rat or the chimpanzee, would be better suited for studying complex social behaviors because of their extended social structure and communication. Regardless of the chosen animal model, we must stay cautious with the interpretation of findings from animal research.