

# Artifacts

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# Effects of interventions for parent/caregiver alcohol use on children: A scoping review

Arrionna C. Sackett, Jack H. Andrews,  
Kristin M. Hawley



Children of parents with alcohol use disorders (AUDs) face increased risk for a wide variety of negative outcomes. Effective interventions have been developed to prevent and treat AUDs and associated problems, but little is known about whether and how much such interventions reduce risk for the children of parents who receive them. A scoping review was conducted to identify and characterize the available published research literature that has examined this question.

The PubMed (MEDLINE) database was searched on March 21st, 2022 using a combination of keyword and MeSH search terms. The search returned 2,519 total records. Each record was screened by two team members with discrepancies resolved by consensus. Eligibility criteria included randomized controlled trials with an appropriate control condition that reported at least one outcome from a sample of children whose parent(s) or primary caregiver(s) received an intervention intended to reduce or prevent alcohol use and/or an alcohol-related behavioral health (BH) concern.

Twenty-six studies were identified, reporting 28 eligible intervention-control group comparisons. All reports (n = 102) from eligible studies were coded to extract key features of the interventions, comparison conditions, samples, moderators, mediators, and outcomes examined, as well as study findings regarding intervention effects on child outcomes.

Collectively, findings indicate that a diverse array of published studies have reported effects of alcohol-related parent-focused BH interventions on children. However, most studies examined multifocal interventions that simultaneously targeted parent BH problems and other risk factors known to influence child outcomes (e.g., parenting behavior), without experimentally isolating the effects of intervention elements targeting parent BH. A minority of studies examined potential mediators and/or moderators of intervention effects on child outcomes. Several domains of theoretically-relevant mediators and moderators were not examined by any studies. More research is needed to expand understanding of the effects of alcohol-related parent-focused BH interventions on children.



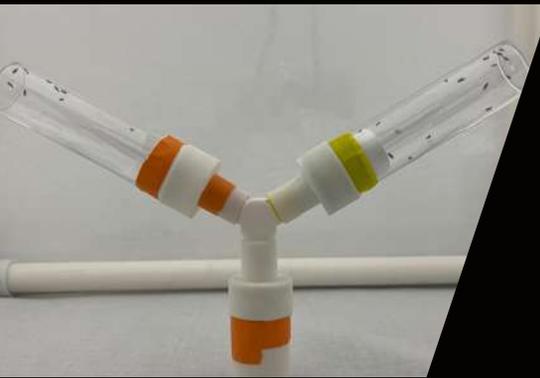
## About the Author



*Arrionna Sackett*

Arrionna Sackett is a senior attending the University of Missouri-Columbia while majoring in Biology and Psychology and minoring in Chemistry. She is from Kearney, Missouri. She will be attending medical school at the University of Loyola Stritch School of Medicine in the Fall of 2023.

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# Identifying the genetic basis of learning skills in *Drosophila melanogaster* through directional selection

Jamie Baumann\*, Reiley Heffern\*,  
Victoria Hamlin, and Dr. Elizabeth King

\*indicates dual award winners

Spring Forum  
Abstract  
Award  
Winner

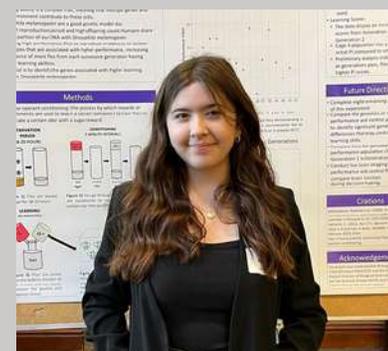
Learning skills are necessary for organisms to adapt to their changing environment. For example, if a population migrates, those organisms may use olfactory stimuli to learn where food or threats are in their new environment. Studies have shown that these skills are influenced in part by one's genetic makeup. Learning ability is a complex trait, meaning that multiple genes and the environment contribute to these skills. In our investigation using *Drosophila melanogaster*, the common fruit fly, we are aiming to identify which genetic variants are associated with higher performance on learning tasks.

Operant conditioning is the process by which organisms learn to predict an outcome from a certain stimulus. We utilize operant conditioning to train flies to associate a certain odor with a sugar reward. We then use Y-mazes to present them with a choice between the odor we conditioned them to (the positive stimulus) and an odor that is not associated with a reward (the negative stimulus). After the test, we collect the flies that correctly chose the positive stimulus and allow them to mate and reproduce, creating our high-performance population. For our experiment, we will be conducting ten generations of directional selection, which allows us to isolate genotypes that are associated with higher performance on olfactory learning tasks and increasing the chance of more flies from each successive generation making the correct choice.

In this poster, we will be discussing the preliminary data from the first three generations of selection, where we expect a relatively minor increase in performance. However, we expect a larger increase in performance by the tenth generation. At the conclusion of the experiment, we will compare the genomes of the high-performance and control populations to identify significant genetic differences that may contribute to learning skills.



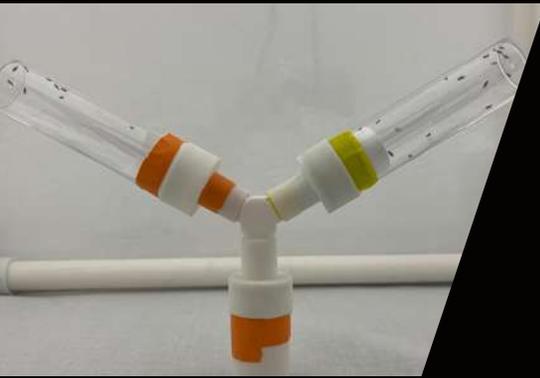
## About the Author



Jamie Baumann

My name is Jamie Baumann, and I am from St. Peters Missouri. I am a first-generation college student majoring in Biological Sciences with a minor in Psychology. Growing up I have always been interested in science, so when deciding what to major in when coming to Mizzou it was an easy choice to make. With doing a large amount of lab work for my science classes, I knew that I wanted to do much more in the lab than just for an outcome of a letter grade. I wanted to be a part of something that had much more meaning, and a larger impact to the world of science. With my strong interest for genetics, my hope for the future is after I graduate, I want to get a master's in Genetic Counseling and eventually become a Genetic Counselor.

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Learning skills are necessary for organisms to adapt to their changing environment. For example, if a population migrates, those organisms may use olfactory stimuli to learn where food or threats are in their new environment. Studies have shown that these skills are influenced in part by one's genetic makeup. Learning ability is a complex trait, meaning that multiple genes and the environment contribute to these skills. In our investigation using *Drosophila melanogaster*, the common fruit fly, we are aiming to identify which genetic variants are associated with higher performance on learning tasks.

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## About the Author



*Reiley Heffern*

I'm Reiley Heffern and I'm a Biological Sciences major from St. Louis, Missouri. I'm a freshman and I work in the King Lab as a part of my Honors College Discovery Fellows program. I work alongside sophomore Jamie Baumann under PhD student Victoria Hamlin on a directional selection experiment aiming to identify the genetic basis of learning skills in *Drosophila melanogaster*. Being involved in research has exposed me to a new side of biology that I'm passionate about and allowed me to develop skills that only hands-on experience can provide. In the future, I hope to pursue my interest in biology through a career in genetic counseling.

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# Regional Differences in Cartilage Biomarker Content Related to Histological Assessment of Tissue Degradation

**Umer Hassan Mallick, Grace Brentlinger, James A. Keeney, MD, James L. Cook, DVM, PhD, OTSC, Aaron Stoker, PhD.**

Spring Forum  
Abstract  
Award  
Winner

**INTRODUCTION:** Osteoarthritis (OA) is a significant cause of disability due to the loss of functional cartilage on the joint surfaces. There is significant variability in the regional development and progression of cartilage loss across the joint surface. This study was designed to characterize differences in OA cartilage biomarker content based on location on the joint surface and OA related changes in cartilage structure. It was hypothesized that there would be significant differences in OA cartilage tissue biomarker concentrations based on level of cartilage degradation and location of recovery on the joint surface.

**METHODS:** With IRB approval and informed patient consent, osteochondral tissues were recovered from patients undergoing TKA for OA. Osteochondral explants were created from specific regions on the tibial plateau and femoral condyle. One half of each explant was evaluated histologically for OA related changes. Protein was extracted from the other half of the cartilage explant and was assessed for various biomarkers. Samples were grouped using histological scores and/or region of collection and significant differences were determined using a one-way ANOVA and Tukey Post-Hoc test.

**RESULTS:** Significant differences in OA cartilage tissue protein content were identified based on region of collection, histological score of the tissue, and when region and score were considered together.

**CONCLUSION:** This study suggests there are region-specific metabolic responses by cartilage that may delineate disease mechanisms associated with the development and progression of symptomatic knee OA. This approach may identify novel diagnostic, staging, and therapeutic targets for OA towards improving outcomes for patients.



## About the Author



*Umer Hassan Mallick*

I am a senior at Mizzou majoring in Biological Sciences, with a minor in Psychology and a member of the Honor's College. I was raised in St. Louis by my parents, who immigrated to this country from Pakistan before I was born. Even as a child, my parents emphasized the importance of strong written and oral communication skills. Additionally, I believe the best way to learn about the everchanging world around us is by exchanging information with individuals who offer a new perspective. Through this research, our team can accomplish these goals, and I am fortunate to be a part of the conversation.

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# Remaining friends from adolescence to adulthood: The role of friendship quality and geographic location

By: **Emmalyn Gerhardt**

Spring Forum  
Abstract  
Award  
Winner

Research has shown the health benefits and social support provided by friendships (Holt-Lunstad et al., 2010). Many studies regarding long-term friendships have focused on friendships stable through adolescence (Bowker, 2004) or through adulthood (Yaniklar, 2012). Few studies have considered the degree to which close friendships are stable from adolescence into adulthood.

The goal of the present study is to examine adolescent friendship stability in the long term, and if it is impacted by friendship quality or geographical stability. The adolescent sample consisted of 314 friend dyads in the seventh or tenth grade. The majority of participants were European-American (62.8%) or African-American (29.2%), with equal numbers of boys and girls. Data collection for the adult sample is ongoing (to date, approximately 200 participants have completed the adult assessment).

During the initial adolescent sample, friendship quality was assessed using a revised version (Rose, 2002) of the Friendship Quality Questionnaire (Parker & Asher, 1993). In the adult assessment, geographical stability was assessed by a questionnaire item that asked for their current and/or permanent address. The current friendship status of the dyads was assessed using self-reports that asked if they are still friends. Regression analyses will test the effects of adolescent friendship quality and adult geographic proximity on friendship stability from adolescence to adulthood. We expect that positive friendship quality in adolescence will increase the likelihood that dyads remain friends from adolescence to adulthood. Friends who continue to live in the same city are expected to be more likely than friends who live in different cities to remain friends, and friends who live in the same state are expected to be more likely than friends who live in different states to remain friends. The results of this study will further our understanding of the stability of adolescent friendships.



## About the Author



*Emmalyn Gerhardt*

I am a fourth-year student at The University of Missouri, on track to earn a Bachelor of Science in Psychology with minors in Biology and Sociology, as well as a Multicultural Certificate, in December 2023. Beyond academics, I am involved on campus as a member of Alpha Phi Omega, a service organization, and the Relationship and Sexual Violence Prevention Center Peer Educators. I am also a part of the Peer Relations Lab, directed by Dr. Amanda Rose.

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# Tutoring is like...charcuterie-ing

By: **Maddie Reiser**

Tutoring and charcuterie boards. That seems like an unlikely pairing, doesn't it? Ordinarily, I would agree, but throughout the semester, I have learned that tutoring can be reasonably compared to any number of things. Whether it be making a pumpkin pie, tie-dying a t-shirt, or making a charcuterie board, many aspects of tutoring are comparable to everyday tasks, tips, and tricks. I think tutoring can be related to a specific charcuterie board tip, especially regarding addressing analysis concerns, the directive versus non-directive battle, and Online Writery responses, or "TONY" responses. This tip is titled "Fill Bare Spots" and reads as follows:

*It occurred to me recently, after scrolling through my charcuterie and cheese Pinterest board, that I prefer the visual look of tightly packed boards. This means filling bare spots with goodness people can eat.*

*It's also where a bag of arugula or similar small loose-leaf lettuce comes in handy. Use it to fill in spaces by tucking it under items that won't be affected by its presence. Plus, it adds a nice pop of green color to the board. Be mindful that you probably won't want to cover the entire board with arugula, unless you're positive that your guests love its peppery flavor. Catching a leaf on a slice of cheese though is a heavenly pairing.*

Starting with the tip's title, "fill bare spots," brings to mind things that are lacking in a piece of writing. Whether that be a personal touch, a part of a student's argument, or addressing a counterargument, we want to minimize bare spots as much as possible. As it happens, the next piece of advice agrees, saying that we must "[fill] bare spots with goodness people can eat." Immediately, this recommendation suggested analysis within a paper. Throughout this class, I have realized that one of a tutor's primary tasks is helping students deepen their arguments, which often requires additional analysis. In this situation, the "bare spots" are areas where a tutor may have a question or where they wish there was some evidence or analysis. In this case, the "goodness" is the analysis because we want to fill up those empty or confusing spaces with ideas to support the student's thesis. I especially like the use of the word "goodness," which means "beneficial or nourishing" ([Oxford Dictionary](#)), because that is exactly what good analysis does for an essay. Analysis is supposed to build up, or nourish, a student's argument and writing.



## About the Author



*Maddie Reiser*

Hi! My name is Maddie, and I am a junior studying political science and business. I am from Pleasant Plains, Illinois, but I was born in Johannesburg, South Africa. I am currently a tour guide at Mizzou and will be starting as a tutor at the Writing Center when I return from my semester study abroad. I am currently studying international law and business in Rome, Italy. Outside of school, I love to read, play volleyball, hang out with friends, and spend too much time and money at Shortwave. After graduation, I plan to take a gap year before, hopefully, attending law school.

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Analysis lies at the heart of most writing, whether it be a rhetorical analysis paper that uses outside sources or a personal statement that requires the student to dive deep into their past experiences. The need to buildup analysis was especially evident in my ninth observation. The student came to Elise, the tutor, for help on a scholarship personal statement. The student discussed many personal topics, but Elise felt that they had only reached a surface-level analysis; Elise noticed a lot of bare spots. Since this was a scholarship essay, we know that whoever reads it is looking for the personality and drive of the applicant and might be put off by these so-called bare spots. Elise used leading questions and conversations to draw out the analysis and add goodness to the student's essay. When a tutor notices a bare spot, as Elise had, it is their job to help the student figure out how to inject more of that "goodness" to ensure that piece of writing is sufficiently nourished--much like we would want to prevent empty spaces in our charcuterie board.

Elise favored leading questions as a tutoring strategy, relying more on non-directive tutoring, but there are also other methods. This charcuterie board tip also brings the push and pull between directive and non-directive tutoring to the forefront. The sentence, "It occurred to me recently, after scrolling through my charcuterie and cheese Pinterest board, that I prefer the visual look of tightly packed boards," can be compared to this debate. Specifically, the phrase "I prefer" stuck out to me here. In terms of balancing directive and non-directive strategies, it's important for tutors to acknowledge that what they want (or "prefer") is not necessarily the best option for the writer. The student may prefer something else. We all have our own metaphorical writing Pinterest Board. Every student and tutor has different writing preferences that require individual choices about creative and practical elements, much like cultivating the perfect Pinterest Board. The heart of tutoring is to help a student express their thoughts, in their own voice, through their writing. As such, figuring out the appropriate balance between directive and non-directive tutoring is one of the most important roles of a tutor.

Throughout the semester, I observed multiple tutors attempting to, and succeeding in, finding this balance. Almost every single one of my observations, excepting my sixth observation, answers the Tutor Strategies box in the same way: leading questions. In my opinion, finding a solid balance between directive and non-directive tutoring is also one of the most difficult parts of tutoring. As tutors, we want to ensure that the writing stays true to the student and their voice, but they come to us for our opinion as well. How do we find a balance? My fourth observation, which was a face-to-face rhetorical analysis session with Anna, gave me the best example of striking this balance. Anna asked a lot of leading questions--a non-directive tool--making the student do the work on the analysis, but she also gave direct advice. Anna said, "I think you should delete this sentence," or told the student what structure she thought would work best. Out of all my observations, this session also felt like one of the most successful, with both tutor and student feeling accomplished, with both tutor and student feeling accomplished at the end. So, while a tutor might prefer their own idea over a student's, they must always be aware of the so-called directive/non-directive see-saw.



*Maddie and her friend Gabby, a fellow writing tutor-in-training at the time and now a full-fledged tutor, preparing for a visual outlining/brainstorming activity in class and laughing with their instructors.*

Finally, the tip's suggestion to "Be mindful that you probably won't want to cover the entire board with arugula, unless you're positive that your guests love its peppery flavor" reminded me of TONY (Online Writery) responses. The Online Writery is a virtual platform where students can submit their work and receive feedback--not edits--from a tutor, and the Writing Center gave it a name: TONY. TONY responses are emails sent to students that include an attachment of their Online Writery submissions, along with comments, suggestions, and thoughts from real tutors. I have found that



it's easy to just keep adding revisions, or “arugula,” when writing a TONY response, since there is no student in front of you. Because of this, we need to be mindful of the length of our TONY responses so as not to overwhelm our tutees.

To avoid a panicked student, tutors must prioritize feedback--we are not positive the student loves the peppery flavor of revision arugula. To me, “peppery” has a negative connotation, much like how an overwhelming TONY response may leave a bad taste in the student’s mouth. Specifically, “your guests love [of] its peppery flavor” plays into these student preferences. I often put in the comments of my TONY submissions, “please give me as many revisions/comments as you can,” so the tutor knows I’m looking for a long, detailed response. In this case, I express that I do love the peppery flavor. However, in the absence of such certainty, it’s best to avoid an overwhelming response and, therefore, a distressed college kid. In my eighth observation, I sat in on Elise doing a TONY response. While her response wasn’t so longwinded as to be considered overwhelming, I observed that I would have approached the reverse outline differently. Elise chose to leave a paragraph-long comment for every paragraph in the reverse outline, commenting on what she liked, disliked, and would change. When we first did our Privacy and 1984 TONY response, I did something similar. However, after I met with Aaron, we decided that it wasn’t the best approach to a reverse outline. Our primary reasoning was that having a set of paragraphs at the top of a TONY response (the reverse outline) followed by another set of paragraphs would be entirely too much for a student to calmly comprehend. In this case, the student probably wouldn’t love the peppery flavor of the tutor’s revision arugula. Therefore, tutors must be conscious of and intentional with their responses and be mindful of not overcrowding the board.

While this tip certainly relates to many aspects of tutoring, it also presents a counterintuitive suggestion. The phrase, “use [arugula] to fill in spaces by tucking it under items that won’t be affected by its presence,” presents advice that I, as a tutor, would not give. In this sense, “arugula” could be outside sources, analyses, or even actual tutor suggestions. Regardless of what the metaphorical arugula is, all parts of a paper or a tutoring session should at least attempt to benefit the writing or the student. For example, during my eighth observation, Elise attempted a TONY response to a metaphysics paper. Due to the nature of the subject matter, she had no idea what the student was trying to argue or what the assignment was saying. While she was stumped on how to approach the TONY response, Elise certainly did not attempt to “fill in the space” with useless suggestions. Instead, she worked incredibly hard to give the student actionable revisions and questions to answer--the goal was to affect the student’s writing and revisions. Admittedly, tutors will likely run into a situation where the student and the tutor feel unsatisfied, but nonetheless, both parties will have attempted to improve the paper. Ultimately, every step in the writing process should seek to better the writing or the writer; nothing should be “tucked under” or away as means to avoid impacting the paper. We want tutoring to be impactful.

The past semester has enabled me to see connections between tutoring and other things that hadn’t been apparent before. In one way or another, tutoring is similar to many aspects of life. I have made countless charcuterie boards, yet I had never associated it with any part of my writing experience, let alone helping other students write. I can now see those connections. Whether it’s the quality of analysis, revision “arugula,” or understanding that tutoring is meant to be impactful, tutoring fills in the bare spots.

Full List of Tips:<https://lajollamom.com/how-to-make-charcuterie-cheese-board/>



# Climate Literature Can Compel Humans to Care About Climate Change

By: **Brianna Forrey**

There is a newer literary genre on the rise containing stories of rapidly shifting climates that threaten the survival of mankind. This genre is known as climate literature, and it includes both fiction and nonfiction pieces written by authors with different backgrounds and levels of expertise. Climate change has become a significant topic in mainstream discourse due to growing concerns about the state of our planet, so it is no surprise that climate literature has become increasingly popular in recent decades.

In English 4996W, a Senior Honors Seminar taught by Dr. Noah Heringman at the University of Missouri, students were asked to read various works of climate literature and write about these works throughout the semester. The goal of the class was to promote this new genre and contextualize the global climate crisis by allowing students to critically analyze themes and messages within the works that they read. For my final paper, I was inspired by Roy Scranton’s argument in his book, *Learning to Die in the Anthropocene: Reflections on the End of a Civilization*. He urges people to refocus their attention to the humanities (art, literature, culture, Greek/Roman philosophy, etc.) as a way to move through the Anthropocene, an era that is defined by the environment’s negative responses to human activity.

In my final paper, I argue that there is one component of humanism that is the most influential on approaches to the climate crisis, and that is literature. I specifically vouch for climate literature’s ability to persuade the masses to care more about climate change. I claim that the aged literary references in Scranton’s book, *The Epic of Gilgamesh*, *The Iliad* by Homer, and *The Thoughts of Marcus Aurelius Antoninus* by Marcus Aurelius Antoninus, demonstrate many thematic concepts present in modern-day climate literature.

A qualitative study published in 2020 in the journal of *Environmental Communication* found that reading climate fiction had positive impacts on beliefs and attitudes about climate change. These findings are remarkable considering the limited amount of research about climate literature that is available to the general public. For this reason, my paper urges the general public to consider reading climate literature in order to positively affect their perceptions of global warming.

My enrollment in Communication 4420HW, Communicating Research and Scholarship, taught by Dr. Amy Lannin and Dr. Linda Blockus at the



## About the Author



*Brianna Forrey*

My name is Brianna Forrey, and I am a senior at the University of Missouri majoring in English and Communication. I am a member of the Honors College at Mizzou, and I am also a Senior Crisis Counselor for the 988 Suicide & Crisis Lifeline. I work for a local nonprofit organization called DeafLEAD. I plan to go to law school after graduation to pursue copyright law.

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University of Missouri, offered the chance to present my research via poster presentation on Fall Research Day 2022. This was such a great opportunity for me to share my work with a lay audience and emphasize the importance of reading past, present, and future literary scholarship about climate change. I was also able to share how much reading climate literature positively affected my own personal perceptions of the climate crisis.



“Using Climate Literature to Compel Human Civilization to Care About Climate Change” – Brianna Forrey  
Poster Presentation, Fall Research Day 2022



# Autism in Women and Girls: Benefits and Challenges for Women or Parents of Girls Navigating Autism Spectrum Disorder

By: **Mikayla Kitchen**

## ABSTRACT

This brochure explores benefits and challenges for women or parents of girls exploring Autism Spectrum Disorders (ASDs). It provides information about what Autism Spectrum Disorders are and the difference between internal vs external presentations of the disorders. Additionally, the brochure dives into some benefits of a diagnosis and why women and girls experience higher rates of misdiagnosis/undiagnosis.

Access a high quality version of the brochure: [Autism in Women and Girls](#)



## About the Author



*Mikayla Kitchen*

Mikayla is a third-year student at the University of Missouri studying public health, political science, and leadership & public service. She loves the outdoors, hiking, climbing, and also loves to cook and bake for her friends and family. She is currently interning in the state capital and will be spending her summer interning in our nation's capital. She is interested in the intersection between public health and policy and is planning to pursue a career in health policy.

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**WHAT IS AUTISM?**  
Autism spectrum disorders (ASD) are behavioral disorders. Those with ASD often experience repetitive behaviors and movements, barriers/differences in social interaction and communication, as well as a host of other symptoms.  
Every autistic experiences a **different combination and severity** of symptoms. Some include repetitive movements, sensory sensitivities, misunderstanding social cues, and focused hobbies or interests. This list is not exhaustive, just a few common symptoms.  
Additionally, research suggests that autism may present **differently in women** than it does in men, even from a young age.<sup>1,2,3,4</sup>

**WHAT IS THE BENEFIT OF A DIAGNOSIS?**  
For many women, having a diagnosis comes with a sense of **freedom or relief**. In a recent study, many women expressed feeling as though they now understood why they were different and that they were **not alone**.<sup>5</sup>  
Having a diagnosis may also help **reduce negative internal beliefs** about oneself. ASD has been shown to have high rates of co-occurrence with mental health conditions such as anxiety, OCD, and depression.<sup>5,6</sup> Reducing negative internal beliefs may reduce the burden of the co-morbid conditions.  
Additionally, receiving a clinical diagnosis may allow you or your daughter access to **more support and resources** in learning or professional settings.

**AUTISM IN WOMEN & GIRLS**  
Benefits and challenges for women or parents of girls navigating Autism Spectrum Disorder

**REFERENCES**

**HOW IS ASD DIFFERENT FOR WOMEN & GIRLS?**  
Research has found that the difference in ASD between men and women is often an internal vs external presentation. Women experience much higher rates of **internal presentation**.<sup>2,3,4</sup>  
While it is hard to list the exact differences between internal vs external, some comparison can be made. For instance, shutdowns are internal whereas meltdowns are external. Many women may feel the **social pressure** to not appear "emotional" or "crazy" and may opt for an internal **shutdown** when overwhelmed. **Anxiety** and **sensory sensitivities** also present internally, especially if the autistic is adept at masking the symptoms by creating structure and routine. An internal presentation of ASD may also have **smaller stimming motions**, such as tapping a pen as opposed to hand flapping.  
Rates of masking, or camouflaging ASD symptoms, are also found to be much higher in women.<sup>1,4,5</sup>

**WHAT IS MASKING?**  
Masking is something that all humans learn at an early age. It is the act of **hiding** or **falsifying** certain parts of yourself to **fit in** socially.  
This could mean not using swear words during a corporate meeting, or it could go deeper into hiding parts of yourself. For those with ASD, whose social norms are often different than those around them, masking can take up a lot of energy and make them feel more **discomfort** in a world that already presents several barriers.  
Women may mask at higher rates because of the historic differences in the way women have been expected to act in society. Women and girls learn early in life what is "**acceptable**" and how to "**fit in**", which leads to masking, **even at young ages**.<sup>1,3,4,5</sup>

**BARRIERS TO DIAGNOSIS**

**01**  
Masking  
Many studies have shown that masking is a significant barrier to receiving an accurate diagnosis for women.<sup>2,3,4</sup>

**02**  
Internal Presentation  
Current "gold standard" testing tools have been shown to not assess for some internal symptoms of ASD that women experience at higher rates than men.<sup>7</sup>

**03**  
Early Developmental Differences  
One study found that not showing early developmental differences was the strongest predictor to not screening positive for ASD using one "gold standard" diagnostic tool.<sup>8</sup> Women who experience internal symptoms may not present with ASD until later in life.

Recent rates of diagnoses have been **1 woman for every 4-5 men**.<sup>1</sup>

Higher rates of masking in women could be a **contributing factor**.<sup>2,3,4,5</sup>



# Mental Health and Hormonal Birth Control

By: **Olivia Marshall**

## ABSTRACT

This infographic presents research on the potential consequences that hormonal contraceptives could have on a woman's mental health. This analysis presents evidence that women of all ages taking hormonal birth control are at a higher risk for experiencing depressive symptoms at some point in their lives.

Access a high quality version of the infographic: [Mental Health and Hormonal Birth Control](#).



## About the Author



*Olivia Marshall*

My name is Olivia Marshall, and I am studying Health Science with an emphasis in Health and Wellness Services. I am a member of the Golden Girls dance team as well as a member of the Delta Delta Delta chapter at the University of Missouri. I am involved in the Pre-Physician Assistant Club and the School of Health Professions Student Council. I intend to pursue a masters in physician assistant studies after graduating with my bachelors in May of 2023. I am passionate about women's health and hope to practice obstetrics and gynecology in the future.

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### MENTAL HEALTH AND HORMONAL BIRTH CONTROL

**12%** of all women will experience depression at some point in their life. Women, in comparison to men, have a **70%** greater chance of experiencing depression.

Of the women who are using contraception, **43%** of them are using **HORMONAL CONTRACEPTIONS.**

#### TYPES

Pill, Intrauterine devices (IUD), injections, arm implants, patches, and vaginal rings

#### HOW THEY WORK

They secrete hormones into the body that stop the release of an egg, prevent sperm from getting into the uterus, and make the uterus less suitable for fertilization.

#### HORMONES AND THE BRAIN

The hormones in many forms of birth control, estradiol and progesterone, have been found to affect the parts of the brain responsible for regulating mood and behavior.

#### RISK FOR DEPRESSION IS INCREASED

In order to measure depression, researchers use the Beck Depression Inventory (BDI) assessment. Women who were currently using hormonal contraceptives or have ever used hormonal contraceptives were asked to complete this assessment. Researchers found that these women had **higher BDI scores** as compared to women who have never taken hormonal contraceptives. Also, the women who were using hormonal contraceptives for a **longer period of time** had higher scores on the BDI scale. After beginning hormonal contraceptives, symptoms among women with Major Depressive Disorder (MDD) were more severe.

#### SUICIDE RATES AMONG WOMEN

An unfortunate result of depression is **suicide**. Researchers examined whether or not there was a link between hormonal contraceptive use and suicide attempt. These women were 15 years old and had not been using hormonal contraceptives prior to the start of the study. They studied these women until the age of 33. They found that the women who started using hormonal contraceptives during the study had a **higher rate of suicide attempts** than those who did not take birth control. Adolescents between the ages of 15-19 who were taking hormonal contraceptives had the highest suicide attempt rate.

### ESTROGEN VS. PROGESTERONE

There are different combinations of hormones found in birth control. The two most common types are an **estrogen-progestin** combination and a **progestin-only** form. When estrogen and progesterone are combined, women have less severe depressive symptoms, greater physical health, and fewer anxiety-related problems. **Estrogen is the key.** Estrogen has been known to help regulate serotonin levels, whereas progesterin has the opposite effect. Therefore, a progestin-only contraceptive can lead people to have more severe depressive symptoms. Taking a combination of estrogen and progesterone can still cause depression, but the severity is lessened.

### RISK FOR ADOLESCENTS

Children between the ages of **10-19** are at a greater risk for experiencing depressive episodes at some point in their life when taking hormonal contraception. Adolescents who use birth control are at a **greater risk** because parts of their brains, such as the amygdala, hippocampus, and prefrontal cortex, are all still developing. These parts of the brain regulate **emotion**, and the hormones found in contraception are known to affect these areas and **hinder their development**. Women who start taking hormonal contraceptives during adolescence show lower levels of cortisol responses, meaning that they are unable to respond well to stress. Low reactivity to stress can be a **risk factor for depression**. Additionally, these teenagers' hippocampus had **thinner** white matter and myelination than normal, which is linked to poorer cognitive function and depressed symptoms. Teenagers are more susceptible to depression the longer they use hormonal birth control.

### WHAT CAN WE DO?

**Birth control is not only used for preventing pregnancy.** Women use birth control to help regulate their menstrual cycle, treat acne, endometriosis, and to help prevent certain cancers. Physicians should take into account a woman's mental health history before prescribing hormonal birth control. If a woman has a history of depression, then they should not be prescribed a progesterone only contraception. There are combination pills that contain estradiol that have shown to be less likely to cause changes in mood. Doctors should also screen patients for depression regularly while they are on hormonal birth control, especially teens.