

THE PERFECT MATCH: FENCING AND BROADER AUTISM PHENOTYPE–

Reciprocal benefits arising from deliberate collaboration

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Abstract

Is it possible that certain neural atypical individuals may be uniquely well suited for the multitasking, spatial, patterned nature of fencing? In turn, can fencing offer a rare therapeutic oasis for neural atypic individuals? Coaches are reporting (in anecdotal accounts) of an increase of autism spectrum individuals presenting for fencing instruction.

Objective:

What if we, as fencing coaches, could help individuals with more severe Autism phenotype expression to connect with others by removing the feedback that the autistic brain can't easily identify and replace it with a "language" that the Systemizing Brain excels at processing? This thesis explores whether changing common social elements (facial nuance, subtext, single task management) with activities like mimicking, patterning, and full body expressions will tip the advantage toward thinkers who use alternative indicators for thought processing (systematic rather than empathetic) as experienced in fencing. This cognitive range skewing toward Systemizing is commonly referred to as Broader Autism Phenotype (BAP) (Piven et al., 1997; Baron-Cohen, Wheelwright, Lawson, et al., 2002), and, at the greater cognitive extreme HAQ, high autism quotient. I propose a new therapeutic approach to Autism, utilizing fencing, that I call "transcription therapy," which develops the individual's ability to better

communicate by the practice of learning to recognize and convert empathetic communication to quantitative/macro signals, and then back again.

Method:

This paper presents a consideration of:

- Professionally observed trend towards autistic participation in fencing
- The daily challenges autistic persons experience in relation to the specific set of actions and interactions peculiar to fencing
- Introductory discussion of how fencing may manage and develop increased cognitive communication skills

To demonstrate possible ways to work with BAP individuals, a series of exercises was developed and explained within the context. Qualitative data was collected, including informal interviews with collaborating therapists, parents and autistic participants before, during and after fencing activities.

Two simple, initiatory surveys were administered to determine whether the fencing population may be skewed toward BAP individuals or to identify any possible pattern of autism that may already be present in fencing. These surveys were given to a limited sample of fencers (N=173) and a control group of non-fencers (N=127) to determine if athletes involved in the sport might have Broader Autism Phenotypic characteristics. This was done to consider whether fencing might attract higher Systemizing Brain

participants as a general observation. The survey followed established formats created by experts at Cambridge University, developed by principles derived from research by Simon Baron Cohen (2002) and others in the field of Autism (Psychology Tools, 2021).

Results:

The definition Broader Autism Phenotype (BAP) and consideration of challenges faced by BAP individuals led to proposing a new approach: “Transcription Therapy.” Possible ways to work with BAP individuals, called “Transcription Exercises,” were developed and demonstrated. The examples presented used the activity of fencing (sword fighting). Informal feedback by participants was positive.

The survey results showed a slightly higher “systemizing quotient” (SQ) for fencing participants. A refinement of the survey, with a reorganization of the values for each question, might produce a more accurate and usable data analysis. This result might be amplified with a larger sample.

Conclusions:

The results might have application in understanding what cognitive platforms find success in fencing, and whether fencers might naturally serve as ambassadors between individuals with higher Empathetic brains and those with non-neurotypical Systemizing brains. These results may merit a secondary survey to determine if greater prevalence for Broader Autism Phenotype (BAP) exists in the highly systemized sport of fencing. If

subsequent research reveals a predictable distribution of BAP among fencing participants, then fencing coaches and autism therapy professionals can mutually benefit.

Table of Contents

Table of Contents	6
Introduction	8
Part I: The Empathizing/Systemizing Theory of Autism and Broader Autism Phenotype	10
Qualities of Systematizing Brains	15
Qualities of Empathizing Brains	18
Autism Quotient (AQ) Defined	19
The challenge for high AQ athletes is cognitive language.	21
Connection is still a basic human need.	21
Part II: Found in Translation: Using Macro Actions (Like Fencing) in place of Verbal Connection	22
Helen Keller	22
Fencing is a transcriptor.	24
Fencing and Empathetic Development	25
What is Autism Transcription Therapy?	25
Fencing: A Unexpectedly Perfect Fit for Transcription Therapy Modality.	28
Connection by Collection, Transcription and Reflection	32
Examples of basic transcription exercises developed in conjunction with fencing.	35
Mirroring:	36
Fencing Footwork Mirroring	40
Two step Tempo Turns.	41
Mirroring with Fencing Weapons.	42
Bouting in Fencing Transcription Therapy	44
Autistic Individuals and Teaching Others to Fence	45
Feedback from Autistic Participants using Transcription Therapy	48
Part III: Is Broader Autism Phenotype Already Disproportionately Present in Fencing?	50
Methods	50
Participants	50

THE PERFECT MATCH: FENCING AND BROADER AUTISM PHENOTYPE	7
Methods	51
Measurements	52
Results	56
Limitations and Future Research Opportunities	59
Discussion	59
Conclusions	60
Acknowledgements	64
References	65
Appendix A	70
Appendix B	75
Appendix C	78

Introduction

Neural atypical profiles are often lumped into the Autism Spectrum Disorder diagnosis. The traits that are generally recognized as markers for autism can be socially or functionally debilitating for successful integration in a society where the standard is *emotional nuance expression and focused, single task management*.

Research involving neural atypical individuals has produced a model of what is now referred to as Broader Autism Phenotype (BAP) (Piven et. al., 1997; Baron-Cohen, Wheelwright, Lawson, et al., 2002). Previously, this neural atypical presentation may have been labelled simply “autistic,” mild autism, or Asperger’s Syndrome. Additionally, especially in women, BAP may not have been diagnosed or noticed at all due to a lack of significant, measurable, negative life impact. BAP is not considered a condition that requires clinical diagnosis or intervention. The biggest indication of Autism Spectrum Disorder (ASD) vs. BAP is the quantifiable, negative impact requiring professional support for those with ASD.

BAP identification implies a neural processing approach that may be considered an outlier to statistical norms whether positively or negatively expressed. Behaviors associated with BAP include using unique, special interests as persistent conversation topics (e.g., discussing the Pokemon cannon or many ways to cook shrimp), repetitive gestures or phrases, ADHD, difficulty reflecting two-way communication, OCD tendencies, high anxiety, introversion, and being perceived as tactless or narcissistic (Postorino et al., 2017). BAP individuals can have sensory issues with textures, sounds,

and lights, and may exhibit behaviors that seem excessive (e.g., listening to the same song 100 times in a row). It has been documented that BAP individuals can exhibit substantially enhanced visual, spatial, and/or non-verbal reasoning skills as well as higher IQs by psychologist Simon Baron-Cohen (2002). BAP individuals are often experienced as “being lost in their own world,” rigidly stubborn, and unable to emotionally cope with changes in routine.

As stated above, exhibiting a Broader Autistic Phenotype may not be noticed or identified at all unless the associated behaviors impact negatively on the individual's quality of life. When communication (either within one's own body or between the individual and others) is hampered, the individual's progress toward personal, professional and educational satisfaction may be limited. The BAP individual that uses alternative data values (quantitative v. emotive) that may be the most diverse (most quantitative) from neurotypical platforms will also experience the most difficulty in interphasing with their environment and the other people in it.

Aside from other considerations specific to fencing, this thesis will explore whether changing common social elements (facial nuance, subtext, single task management) with activities like mimicking, patterning, and full body expressions will tip the advantage toward thinkers who use alternative indicators for thought processing (i.e., BAP individuals).

This thesis specifically asks:

- 1) How can fencing be of therapeutic benefit to BAP participants?
- 2) How can BAP participants benefit Fencing?

However, in the greater analysis, beyond fencing, this thesis entertains a greater notion. Can changing the communication modalities of the social interaction game determine the “winners”? In other words, *Can utilizing patternized, multitasking constructs like fencing reveal a hidden genius or, at the very least, provide a new pathway for communication in individuals with autistic traits?*

Part I: The Empathizing/Systemizing Theory of Autism and Broader Autism Phenotype

In the first few years of the turn of the current millennium, new theories about autism began to emerge. Instead of classifying autism as a simple disorder, new ideas suggested that ASD was simply a state of brain function leaning uncomfortably on the side of quantitative values. In other words, perhaps the autistic brain was actually about organizing all input into systems, like a computer might store data. The opposite of a “*Systemizing Brain*” was suggested to be an “*Empathizing Brain*” or a cognitive tendency to identify and process all input from a socially, emotionally reflective experience. (Baron-Cohen, Wheelwright, Lawson, et al., 2002) . In other words, an empathizing brain inventories all data using an emotional index for recall and application. For instance, “Do I have a similar experience like this before and how did it make me feel?” or “Does the person I am talking to feel the same way that I do? Do the

same things give us similar feelings?” Within the individual’s own body, experiences are even categorized by feelings, i.e. “Does this make me feel good or bad?”

The Systemizing Brain might say instead, “I’ve experienced this scenario 834 times and 219 of them were on Tuesdays.” Additionally, an empathizing brain may be able to process reflecting conclusions, such as, “I am hot, I should cool down,” which motivates an action like taking off one's coat. The systemizing brain, alternatively, may be continually collecting empirical data without drawing a reflecting conclusion, such as “my feet are sweating,” “my face itches,” etc. Without drawing a self-reflecting conclusion to motivate action, this overload of empirical data values can become action oppressive.

The researcher most notably credited for the Empathetic/Systematic Brain view is Simon Baron-Cohen (2002), who arranged this theory into an explanation which, at the time, claimed that the systemizing brain was a cognitive pattern more statistically present in biologically-male individuals. His research showed a 60% systemizing cognitive platform in males vs. a 60% empathizing cognitive platform in females. For this reason, he labeled his theory "The Extreme Male Brain Theory of Autism" and suggested that the autistic brain was reflected in his data as being in an even deeper quantitative value state than the average male brain score. This, Baron-Cohen showed, was true even for the female subjects in his study who had been previously diagnosed with ASD.

In his research, Baron-Cohen divided his population samples into five phenotypes:

- **Type E**, whose empathy is at a significantly higher level than their systemizing ($E > S$).
- **Type S**, whose systemizing is at a significantly higher level than their empathy ($S > E$).
- **Type B** (for balanced), whose empathy is at the same level as their systemizing ($E = S$).
- **Extreme Type E**, whose empathy is above average but whose systemizing is below average ($E \gg S$).
- **Extreme Type S**, whose systemizing is above average but whose empathy is below average ($S \gg E$).

This explanation of cognitive platform is known currently as the *Empathizing/Systemizing Brain Quotient* (more simply labelled as “Brain Quotient”) and it simply gives a rough numeric value to an individual's preference for experiencing life and retaining information about people and one's environment. Subsequent research by N. Goldenfeld, S. Baron-Cohen & S. Wheelwright (2005) demonstrated such a population distribution, as seen in **Figure 1**.

When Baron-Cohen (2002) formulated his Brain Quotient theory relative to autism, he was attempting to show why male subjects seem to be diagnosed in much higher proportion than females. While in many cases backed by research and

assumedly well intended, the end result was a very heavy coating of stereotypically and poorly applied sexism (Krahn & Fenton, 2012; Storms, 2019). The theory did not age well as a result. Presently, we are able to re-frame Baron-Cohen's insight with less emphasis on gender alone and more emphasis on cognitive organization in a more universal and diverse view.

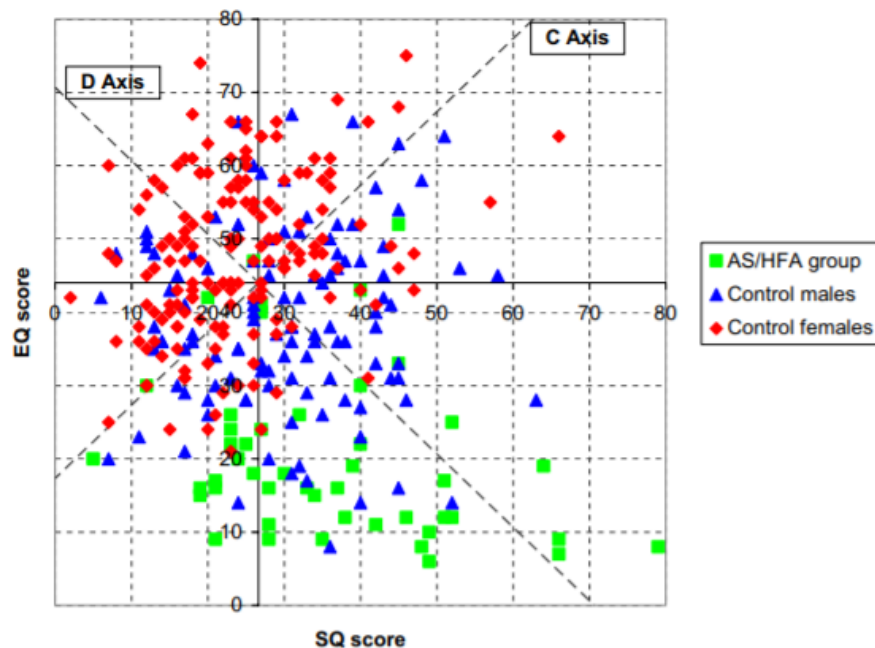


Figure 1

Note: Graph displaying distribution of Empathetic (EQ) and Systemizing (SQ) thinkers in Autism spectrum individuals (AS/HFA group) as compared to Control Males and Control Females representing the general population of individuals. Colored shapes represent the individuals participating in the study. From "Empathizing and systemizing in males, females and autism," by N. Goldenfeld, S. Baron-Cohen & S. Wheelwright (2005). *Clinical Neuropsychiatry*, 2(6), 338-345, p. 340.
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With the idea that ASD may actually be an outlier position of data processing preference/predisposition, rather than a defect, a different perspective can emerge. What if we are *all* processing on an empathetic-systematic range? As Jim Sinclair, co-founder of Autism Network International, argued in 2010:

Probably the single biggest bit of evidence that autism and neurotypicality are distinguished dimensionally comes from the diagnostic process. There is no categorical marker of autism – no blood test, no brain scan, no hormone profile, no shoe size – and as such the diagnostic process is more of a quest for signs and clues that this ultimately socially-constructed label “autistic” is the right fit for the person in front of you.

Everyone has a tendency to process information systematically or empathically. Some are quite balanced in the use of these two cognitive tools collaboratively. But most individuals lean towards one direction or the other. Using simple tools like self-assessment screenings, we can make a rough estimate of our own Brain Quotient.

Those individuals who test at more than 60% Systemizing Brain Quotient can be said to have a Broader Autistic Phenotype (BAP) – in other words, they have traits that are in common with “autistic” subjects (Piven et. al., 1997; Baron-Cohen, Wheelwright, Lawson, et al., 2002). Autism is only a diagnosis for the purpose of treatment, when an individual requires assistance/therapy to live a quality life. BAP can apply to those individuals exhibiting traits and do not require assistance or therapy.

Having a greater Brain Quotient self-awareness can help by identifying:

- 1) How information is processed (emotional/empirical).
- 2) What data is valued? What other data exists that is not valued?
- 3) How do other people communicate? Do they value the same data?

Knowing one's Brain Quotient facilitates communication by helping to organize information effectively. When individuals organize what they value, they can identify it and use it to make decisions more effectively. When they organize what information that *others value* they can better communicate their desires and needs in relation to others and vice versa.

Qualities of Systematizing Brains

Systematizing Brains are all about Input-Categorical Operation-Output.

For example;

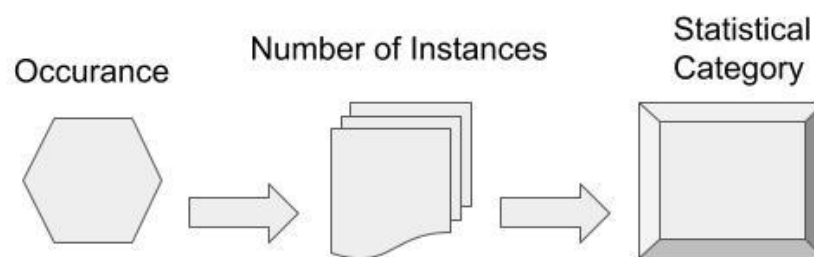


Figure 2

Or another such Systemizing Brain program might be:

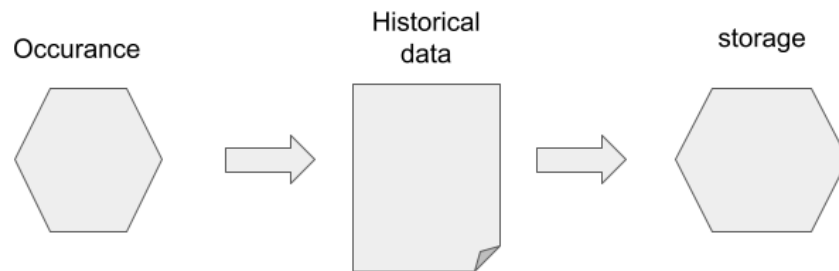


Figure 3

While an Empathetic Brain might run a program like this;



Figure 4

The most notable feature in the given two examples of these cognitive programs are the quantitative component they express as the basis of organization. It is important to remember that one or two of these expressions do not equal a certain Systemizing Brain but exhibiting a majority of these can be generally viewed as a product of a person who organizes information quantitatively. Perhaps they organize with an "If, then" perspective. Perhaps they organize all items according to a specific reference like animals, or numbers, or historical dates. In a person who is possibly only slightly higher scoring on the Systemizing Brain category, this tendency to categorize by tangible information may manifest in many expressions (i.e. time, instances, statistical outcomes, etc.) all processing input apart from the empathetic concern, "how does it make me feel?"

The following indicators seem to accompany what is classified as a "Systemizing Brain Quotient":

- Constructive Toy preferences (i.e. Legos, blocks, etc.)
- Profession - metalworking, weapon making, construction, etc.
- Academic Interests: Math, physics, engineering, computers
- Detail Oriented - classification, organization
- Map reading
- Data Systems
- Statistics

(Piven et. al., 1997; Baron-Cohen, Wheelwright, Lawson, et al., 2002).

Qualities of Empathizing Brains

It is fascinating that in Baron-Cohen's research he makes a point of using profession choice as a Brain Quotient marker for Systemizing Brains but not for Empathizing Brains. One could argue that empathetic ability makes for better artists, musicians, healers, caretakers, and even politicians. Even so, the following traits are generally recognized as belonging to a more Empathizing Brain Quotient:

- Mind Reading - the ability to extrapolate emotion based on subtle facial/bodily cues/reading energy
- Complex Facial Expressions - distinguish different emotions based on facial expressions
- Eye contact.
- Language development.
- Faux Pas - the ability to know when you are offensive to others.
- Sharing and turn-taking.
- Responding empathically to the distress of other people.

(Piven et. al., 1997; Baron-Cohen, Wheelwright, Lawson, et al., 2002).

Once again, the important concept is that a person who expresses as an Empathizing Brain does not need to possess all of these traits. (This list is not inclusive of all possible Empathizing traits.) An Empathizing Brain is only designated as such if the emotive cognitive approach is preferred to the quantitative organization. If an individual more routinely uses emotive data to make decisions and interact with their surroundings, then they can meet the definition of having an Empathizing Brain.

Autism Quotient (AQ) Defined

By definition, as previously theorized by Baron-Cohen, having an Autistic phenotype of any degree means that the brain operates more predominantly on a systemizing organizational platform. Therefore, a greater percentage of systemizing preferences (or Systemizing Quotient) results in the lesser/weak expression of Empathizing connections (or Empathizing Quotient). *This is summarized in the equation $SQ > EQ = AQ$ where AQ is "autism quotient."* On a general, less severe level, having a slightly greater AQ only means that the individual in question prefers quantitative input over emotional connection. Individuals with a lower but positive AQ are part of what is currently considered as Broader Autism Phenotype (BAP) (Wheelwright et al., 2010). These individuals might possibly be mathematicians, accountants, collectors, etc. and may often be seen as "quirky" in society but not outside of accepted social perimeters or behavior.

Individuals with a higher, positive AQ (HAQ, high autism quotient) wherein the individual lacks enough empathetic communication to interact on a basic functional level in society usually equals a diagnosis of Autism. The diagnosis is merely for the administrative purposes of therapy, insurance, educational plans and possible pharmaceutical support in treating adjacent symptoms, i.e. anxiety. This clarification is important in acknowledging that simply having a positive AQ is not a disability or condition that necessarily needs to be corrected. On the contrary, it could even be an advantage, for instance, depending on the individual's chosen career path. Understanding that there exists a scale of cognitive processing that includes both empathetic and systematizing affinity is paramount to the realization differences are not necessarily negative. They could be just the opposite. The task at hand is possibly for society to understand that a communication challenge exists but is worth addressing.

The challenge for high AQ athletes is cognitive language.

High AQ brains are receiving the same visual, auditory and environmental input that statistically common cognitive brains receive. But because the HAQ (high autism quotient) brain organizes input with heavy emphasis on macro-physical & quantitative elements, empathetic information may be deprioritized or even not understood as relevant information at all. Interpersonal empathetic signals may be so meaningless to the systematizing brain, it interprets these elements as white noise, or even irritating feedback. Over time, the Systematizing Brain either experiences these elements as painful and distracting, or filters them out all together. Empathetic signals become a completely foreign language. Empathetic information is like a computer code for which the High AQ brain isn't programmed to interpret, translate, or transmit. The end effect is the lack of recognition of any communicative effort from other individuals, as well as the inability to truly reply by the High AQ individual.

Connection is still a basic human need.

Although HAQ (high autism quotient) individuals may not speak the same cognitive language as most everyone around them, they are still human beings with the need to connect and express value, and feel self value. They still need connection and community. How does one connect with someone who doesn't interpret anything like the majority of individuals do?

Part II: Found in Translation: Using Macro Actions (Like Fencing) in place of Verbal Connection

What if we, as fencing coaches, could help individuals with more severe Autism phenotype expression to connect with others by removing the feedback that the autistic brain can't easily identify and replace it with a "language" that the Systemizing Brain excels at processing?

Helen Keller

Helen Keller provides one example of communicative connection with a HAQ person. Before she was two years old Keller was stricken with an unknown virus, leaving her blind and deaf. She grew up angry, bewildered at life, and violently out of control. In desperation, her parents employed Anne Sullivan, a tutor with experience working for the Perkins School for the Blind. Ms. Sullivan employed a technique of signing words into her student's outstretched hand. The technique was meaningless until the moment that Sullivan began spelling w-a-t-e-r while pumping water over Keller's hand. Keller later wrote:

As the cool stream gushed over one hand she spelled into the other the word water, first slowly, then rapidly. I stood still, my whole attention fixed upon the motions of her fingers. Suddenly I felt a misty consciousness as of something forgotten—a thrill of returning thought; and somehow the mystery of language was revealed to me. I knew then that ‘w-a-t-e-r’ meant the wonderful cool something that was flowing over my hand. That living word awakened my soul, gave it light, hope, joy, set it free! There were barriers still, it is true, but barriers that could in time be swept away (Keller & Mansfield Sullivan, n.d.).

The macro-physical experience of the water and the simultaneous spelling of the word helped Keller make the connection between the signifier (ASL for “water”) and the signified (the water itself). In other words, it formed a linguistic “sign” (Culler, 1976; Greenberg, 1977; Lanir, 2019). This connection created communication between the HAQ Keller and the teacher Sullivan. **The water was a translator of the meaning. Without a macro-physical reference, there may have been an endless chasm of silence for Helen Keller.**

Fencing is a transcriptor.

Like Helen Keller, HAQ individuals need a translator or more precisely, a **transcriptor**. A translator changes an object/idea from one form to another in the same medium (like letters or languages). A transcriptor changes an object from one medium to another like spoken words to written words, or DNA to RNA. HAQ individuals need a process by which they can transcribe empathetic, nuanced communication (based on feelings) into empirical, macro signals (non-nuanced, non-facial) in order to understand.

Language -- and its symbol systems-- is usually described in terms of sounds being associated with meaning to produce signs and communicate meaning (Greenburg, 1977, p. 20). As the example of Helen Keller demonstrates, modalities other than speech or non-empathetic visual signals can be used to produce communication. Larger physical movements can also be a modality.

Fencing is the perfect modality. It can fulfill these requirements and more.

Fencing and Empathetic Development

What is Autism Transcription Therapy?

Many autism therapies are constructed and designed for the specific purpose to enable effective life skills for the participants. Currently there are therapies for younger children, including play therapy, Joint attention symbolic play engagement and regulation (JASPER), and Integrated Play Groups (Kasari et al., 2021; Green, 2013).

Finding therapy modalities for older children can be difficult. Some occupational therapies focus on helping high autism quotient (HAQ) children to be able to function better in a classroom setting without disruptive behaviors. Some therapies focus on helping adults to acquire life skills for self reliance and employment. Almost all therapies now in widespread use are meant to adapt the behaviors of autistic persons to their environmental requirements. Less commonly, for individuals 12 and over, do therapies focus on enhancing the brain's ability to sense and label input as meaningful interpersonal communication and then return that signal in kind. Currently, there exists no industry standard therapy, beyond early childhood symbolic play (JASPER), that teaches the brain to recognize empathetic signals and translate them to quantitative information, and then return the processed information back from quantitative to empathetic. ***I propose a new approach, utilizing fencing, that I call "transcription therapy."***

Transcription is the systemized conversion of a language to another usable expression. A translator simply trades one specific word in one language to another. Generally the word transcription would mean either the process of changing 1) genetic code to proteins or 2) verbal sounds to written characters and words. “Trans” is the Latin word element meaning, “to cross from one to another.” “Scribe” is derived from the from PIE root *skribh- “to cut”, i.e. like a vinyl record, or writing in stone, or as with RNA, construct a copy with nucleic acids. It can be said then, that transcription is about the ability to communicate from one medium to a totally different medium. I propose **the term “Autism Transcription Therapy” (ATT)** here (**Figure 4**), which would be *the practice of learning to recognize and convert empathetic communication to quantitative/macro signals, and then back again.*

The purpose of Autism Transcription Therapy would be to:

1. provide the participant with a way to increase cognitive communication skills and social connection and
2. further develop the empathetic part of the brain.

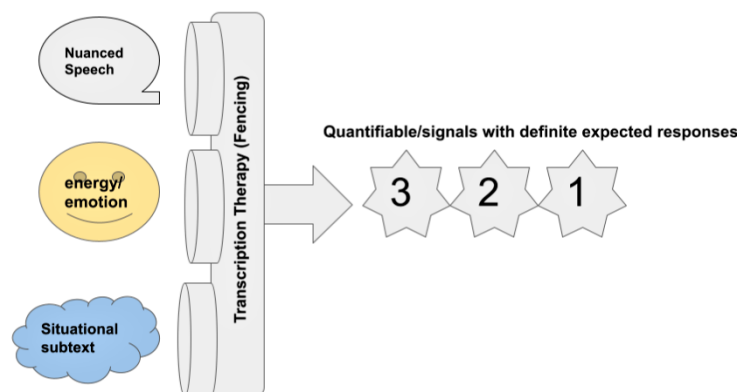


Figure 5

Author's illustration demonstrating how transcription therapy develops the cognitive ability to codify information that other individuals may be sending as heavily empathetic data. The new packages can then be organized and sent back in a format that the intended recipient can also interpret, using fencing (or any other activity that satisfies the requirements of the therapy.)

Any therapy proposed for use in the development of cognitive empathetic skill must satisfy some requirements unique to the challenge of Autism.

- **Engagement Level** - It must be highly physically and cognitively engaging to effectively mute the myriad of competing environmental feedback (i.e. temperature, sounds, hunger, etc.). This phenomenon may perhaps be observed in video gaming, where the participant is so involved in the activity, surrounding information is quieted and hyper focus occurs (Jordan, 2020).
- **Full range feedback** - It must provide positive and negative feedback (reward and penalization) to continually clarify the participant's understanding and refine personal skills. Empathetic individuals often do not value negative feedback because it is emotionally uncomfortable (Leary, 2015). However, as previously discussed, Systematic individuals (BAP or HAQ) are in effect statisticians. Without statistics that provide reflection of objective failures, these individuals can become confused. Systematic cognitives crave the *full picture of both success and failure*, so that the objective at hand can be reproduced reliably.

- **Medium Transfer** - Like the water that sparked the understanding of Helen Keller, the chosen modality of ATT (Autism Transcription Therapy) must have an instant feedback for the attachment of meaning. It has to teach engagement and connection and provide a reason why.
- **Fun** - It must be enjoyable and contribute to positive self consideration, and MOST IMPORTANTLY attach that association with interpersonal connection.

Fencing: A Unexpectedly Perfect Fit for Transcription Therapy Modality.

Fencing meets all of the requirements for meeting the needs of autistic BAP individuals as follows:

Insulation from other competing inputs

Fencing uses equipment that insulates and provides **a physical barrier from the participant and the competing barrage of information from the world.** While equipment can be challenging for participants at the beginning of their experience, often HAQ athletes are able to better focus on task objectives (like reflection, or processing) since the opponent's face is covered with a fencing mask. Psychologists Rachael Jack and Philippe Schyns in a recent article from Current Biology (2015) noted:

One of the richest and most powerful tools in social communication is the face, from which observers can quickly and easily make a number of inferences — about identity, gender, sex, age, race, ethnicity, sexual orientation, physical health, attractiveness, emotional state, personality traits, pain or physical pleasure, deception, and even social status.

While this wealth of information has value for a high cognitive empathizer, the same information will be received as distracting feedback to the strictly systematizing athlete. Not unlike loud static, the face can be a complete disrupter of thought and process. The mask provides a vital edit because it leaves only macro-information, i.e. fencing actions made by the body, for the BAP actor to interpret, process, and then formulate a response

Full-range feedback

Fencing provides full range feedback which functions as a transcriptor.

Fencing provides full, impassive positive and negative feedback. When skills are performed correctly, the participant receives a point. When the skills are not performed correctly, the opponent receives a point. Giving mathematically assigned values (i.e., a point) to a successfully interpreted, interpersonal interaction provides an accounting without an accusation of failure, i.e. misunderstood facial expressions, etc.. Point value feedback is a statistician's language. Because the points are numerical “third party” data, they don't have any additional emotional data, that perhaps a therapist or parent may carry. It is the point assignment that provides the actual transcription dynamic. Without this mathematical judgment, the therapy is only partially usable for the Systematic (BAP or HAQ) thinker. The points are the common ground of quantitative data for both the Systematizing Brain and the Empathizing Brain. They are the element that is commonly valued by both participants and provide the motivation for interaction. The points represent data to BOTH participants that is relevant. Relevance of data may be, in a daily setting, one of the more difficult aspects of communication between the Empathizing Brain and the Systemizing Brain. (For instance, Empathizing Brains do not keep track of how many times an associate has worn red for the last year.) Transcription therapy must include a mutual value of quantitative data.

Medium transfer

The fencing scoring machine is the **Medium Transfer**. It transforms correct interpretation and response into lights and sounds *just like a video game*. The scoring machine provides an absolute judgement. It is not subjective. Fencers either interpret the opponent's actions correctly and hit, or they do not. Providing an absolute bar for success on a per engagement basis establishes trust that objectives can absolutely be achieved. In other words, the participant can say, "I got hit, the scoring machine is unequivocal." or "I hit my opponent". It can be argued that video games appeal to HAQ individuals for this very same reason, that is, clear objectives and feedback. The participant does not need to rely on another confusing, unpredictable human but is interacting with a reliable computer program like an ambassador of clear communication. Numbers can be trusted. They are constant. The fencing scoring machine only responds to 500g/750g of pressure. The numbers provide a reliable foundation for the task. But the other person provides the interaction. The interaction is the benefit.

High level of engagement

With facial expressions muted and all four limbs moving to attack, defend and maintain balance, the physical engagement Level for fencing is high. The mental work that fencing requires to respond to the opponent's sword, requires a cognitive level of engagement. Does the emotional engagement level matter? As Autism Research Group researcher Sebastian Gaigg (2014) explains: "Although individuals with ASD are often

very good at analytical problem solving and express, as well as experience, their emotions differently, it is not the case that they lack emotions altogether.” Therefore, emotions are important and contribute to engagement. Fencing is often portrayed and perceived as romantic, brave, timeless and unique. Individual knowledge that one is “experienced in battle” can derive feelings of confidence. Of course, not every individual that tries fencing will experience the full gamut of these aspects. However, for those that do enjoy fencing, its high level of engagement provides the perfect platform for ATT (Autism Transcription Therapy) because the participants are motivated by fun.

Connection by Collection, Transcription and Reflection

The mantra moving forward for Transcription Therapy should be as described in

Figure 6:

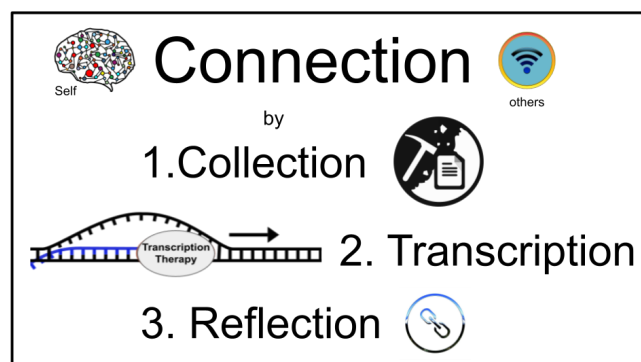


Figure 6

Author illustration depicting the mechanisms of Autism Transcription Therapy.

1. Collection of data sent by a communicating partner. In the scenario of fencing, the collecting portion of the process is simply the willingness to suit up, and participate.
2. Transcription by process of the chosen modality. The transcription provided by fencing would be the recognition that the tactical actions of one's partner result in the scoring machine registering a point.
3. Reflection means that the participant now begins to develop greater affinity to “read” the opponents non-verbal communication (or tactical fencing actions) and respond in kind.

Whatever activity is chosen to be the medium of development, it should teach the HAQ individual the three skills of successful interpersonal interactions. Transcription therapy should include:

(1) The awareness that there is data that can be mined from other's actions. Participants should ask, "How do I collect this data?" "Where are all the places data might be found?" "Is some data better to marginalize?"

The willingness to suit up and participate in fencing, with the understanding that the scoring machine will provide an absolute feedback, constitutes awareness. The participant knows they will need to keep from being stabbed by the partner's sword and to accomplish this, they will need to focus on the partner's actions (or receive the sent data.) This portion of the therapy is referred to as **Collection**.

(2) The therapy itself should provide a medium transformation. This means it should help the participant correlate whatever data they are capable of observing to the result. In the case of fencing, for instance, the participant says "My opponent is coming towards me" and the result is that the participant got hit. Now correlation of those two events can occur. This is **Transcription**.

(3) the participant (after accumulating enough statistical data) can develop a **Reflection** or response from that process. For example, “My opponent comes forward (data) and then I get hit (transcription) so I think I should respond (i.e. move backward, parry, etc) whenever they come forward, so that I don’t get hit.” This process may seem self-evident to the neurotypical person. However, to HAQ individuals, none of the situations that normally present in day to day activities have such a narrow range of actions or meanings. The narrow range of input and output is what makes the Transcription therapy comfortable enough for the participant to develop the interpersonal connection and practice actually communicating by observation. Expectations are clear: hit and don’t get hit. Judgement is not human (the scoring machine) and therefore, predictable and quantitative. This is not unlike having an interpreter. After a set amount of practice with the language, the interpreter is not as needed.

In everyday interactions and situations, over time, the HAQ individual’s ability to observe the actions of others in a meaningful fashion wanes. There are simply too many variables and outcomes and absolutely no readily apparent mathematical applications or values. Using a transcription therapy like fencing reduces those variables and the social repercussions that might be attached. Transcription (fencing) therapy provides a fresh, new learning platform to revive/develop those life skills, all while increasing individual self worth. “Self-efficacy reflects the judgments, beliefs, or expectations about a person’s capability to behave, engage, or implement actions in a

given situation” (Rezayat & Nayeri, 2013). The hope for transcription therapy is that the HAQ athlete will improve self worth, ability to receive information and increase value for any data that interacting with others can provide. This goal is to increase interaction and connection with others by increasing the quantifiable value of their actions (in this case, their fencing actions.) In turn, there may be an increase in the value of interacting with Autistic athletes, as their skill in fencing improves.

Examples of basic transcription exercises developed in conjunction with fencing.

There are a variety of ways that fencing can serve as a transcriptor for HAQ individuals. What follows are just a few examples of such exercises and how they would work.



Figure 7

BAP participants and fencers both participate in an activity where they can create a fake facial expression on their masks to emphasize that facial expressions may not always express intentions, or other data, especially to autistic athletes. This was not specifically a transcription exercise but rather an introduction to both sets of participants (Autistic and neurotypical) about the nature of the activities and familiarizing them with one another.

Mirroring:

Mirroring can be defined as

...the behavior in which one person unconsciously or consciously imitates the gesture, speech pattern, or attitude of another. The concept often affects other individuals' notions about the individual that is exhibiting mirroring behaviors, which can lead to the individual building rapport with others.

Mirroring is the subconscious replication of another person's nonverbal signals. This concept takes place in everyday interactions and often goes unnoticed by both the person enacting the mirroring behaviors as well as the individual who is being mirrored. The activation of mirror neurons takes place within the individual who begins to mirror another's movements and allows them a greater connection and understanding with the individual who they are mirroring, as well as allowing the individual who is being mirrored to feel a stronger connection with the other individual. Mirroring is distinct from conscious imitation under the premise that while the latter is a conscious, typically overt effort to copy another person, mirroring is unconsciously done during the act and often goes unnoticed (Mirroring, 2021).

Mirroring as an exercise might be best utilized with one facilitator/coach/teacher and at least two HAQ participants. The objective is for the participants to observe and copy the partner's macro actions in real time. The target participant will be the "copier" first. The facilitator may serve as the "leader" in the exercise and the second HAQ participant will observe. The leader will do "macro actions", meaning they will perform actions that are non-facial and can be seen from a small distance. Examples are jumping, walking, waving arms, clapping hands, turning around, hopping on one foot, etc. (see **Figure 6**). The participant is working to observe and collect the data (the other person's actions) and then reflect the data by performing the same actions at the same time.

Once the exercise has been successful to satisfaction, the first participant can be re-assigned in the role of leader and the second participant can be re-assigned as the new copier. The participants may switch roles, as well as practice the exercise in either role with the facilitator.

This is a very important exercise for persons who normally shrink from interpersonal interaction whether verbal or otherwise. Its benefit is that it provides opportunity for nonverbal communication in a fun and playful setting. Knowing that the exercise is a preamble for learning to sword fight serves as motivation and lessens the stigma of therapy.

Mirroring can be slow or fast. The better the participants become at the game, the more variables can be added. Examples of variables can include:

- Changing the speed of the actions from slow to fast and then back to slow.

- Changing the reflection from exact mirroring to counterpart reflection, i.e. if the leader goes forward, the copier goes backward, if the leader jumps up, the copier squats down.
- Adding a ball to one or both hands and having all of the actions include the movement of the ball.
- Adding an additional differently colored ball to the leader's other hand and having the copier hold identical balls in opposite hands. Tell the copier to match the leader's actions with the corresponding ball.



Figure 8

A therapy participant and facilitator practicing Mirroring.

**Figure 9**

A therapy participant and facilitator practicing Mirroring.

The facilitator may observe that the HAQ participants have more difficulty staying focused and performing the exercise without disabling self-consciousness. In this situation, the facilitator can introduce the fencing mask. Because the exercise began with the face exposed, the participant may now regard the fencing mask as a protectant from uncomfortable eye contact (**Figure 10**). In this sequence of events, the mask might well be welcomed as a desired and helpful addition as opposed to an item that adds to sensory overload, as is often a challenge.



Using fencing masks and balls to add and enhance Mirroring.

Figure 10

Fencing Footwork Mirroring

Once the concept of Mirroring has been introduced, practiced, and mastered, the facilitator can add basic fencing actions. Using advances, retreats, lunges and recoveries, the participants will practice reciprocal reflection. That is, when the leader advances, the copier retreats. When the leader retreats, the copier advances. When the leader lunges, the copier retreats twice and then lunges back. The goal is for both participants to master both the lead and copy role. Although there is benefit in playing the game without masks, the objective is to play with the masks to the end that the participants are “speaking” to one another without any facial distractions (**Figure 8**). This is not only preparing the individuals for fencing but is also achieving the goal of reducing signal overload and encouraging greater meta-data mining and focus.

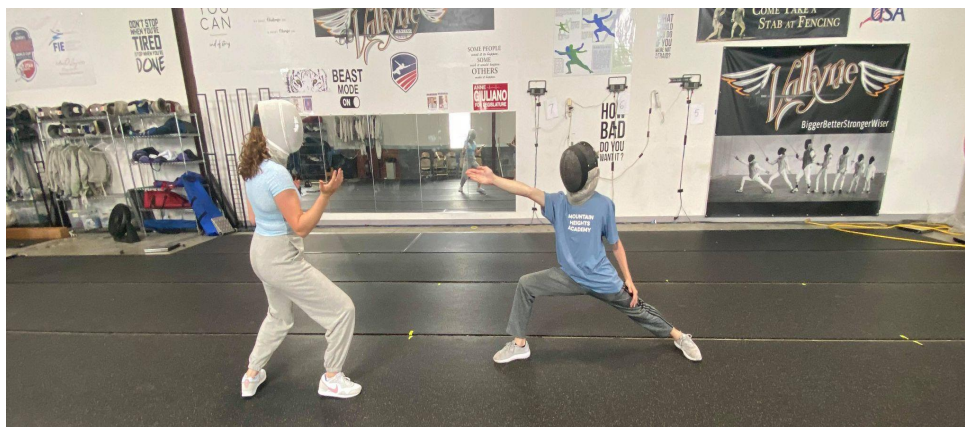


Figure 11

Practicing reciprocal footwork with a partner utilizing masks to hide facial expressions that may be confusing or distracting.

Two step Tempo Turns.

This game has been played in the fencing world for quite some time and it is a perfect segue to full fencing therapy. It is a bridging exercise from strict partner mirroring to the **collection/transcription/reflection** processing that fencing enables. It is sometimes called “The Glove Game” in fencing clubs. Participants hold a fencing glove in their weapon hand or dominant hand. (Consider replacing the fencing glove with a foam sword or half foam swim noodle to liken it more to actual fencing **Figure 9.**) Each partner is allowed two steps or forward foot actions which is called “the attack.” For instance, a player can advance OR advance twice, and then lunge. The other partner must retreat out of distance to avoid being “touched” or struck with the foam sword. If the attacking player hits on either of the two forward foot actions a point is awarded. The retreating (backward stepping) player may not block the attack, but instead must retreat out of distance. However, once the first player’s two attacking steps have completed, the retreating player may attempt an attack in return. Wherever the retreating player is at the finish of the initial attack, becomes the spot where the returning two steps must begin. The players will each take turns attacking and retreating out of distance until someone scores. It is best to keep masks on not only for safety but also to continue working through any equipment-related sensory acclimation.

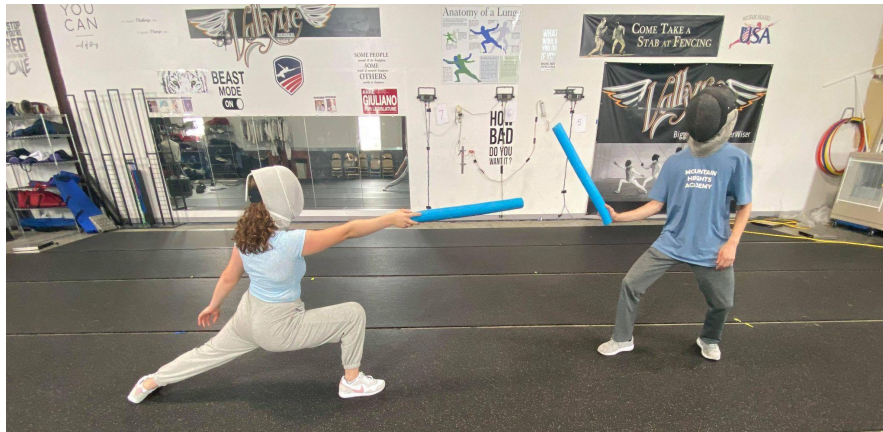


Figure 12

Two step tempo turn-taking (a.k.a., “the glove game”) with foam swords.

Mirroring with Fencing Weapons.

Once again, this is a segue exercise meant to develop skills including;

- focus endurance
- overcoming stimulation hypersensitivity through equipment use
- interest in “macro” interpersonal communication (actions, instead of words or facial expressions)
- **data collection** (comprehension of partner’s actions)
- **reflection** of the data that is collected from observing one’s partner.

At this point participants are not quite ready to fully **transcribe**. Like language class, mirroring participants are “hearing” or comprehending the language of fencing by repeating back what is being presented. In fact, the Two Step Turn game offers a platform for transcription that this game does not. Both players in the Two Step game have to process a response to the attack offered by their partner. In order to progress all the way to actual fencing, the equipment needs to be added into the progression in a more reductive fashion. Once participants are comfortable, confident and having fun while using equipment and utilizing simple macro-communication (body actions) then they will be prepared to move on. Until then, all participants are working on both ends of the transcription therapy sandwich (**Figure 13**).

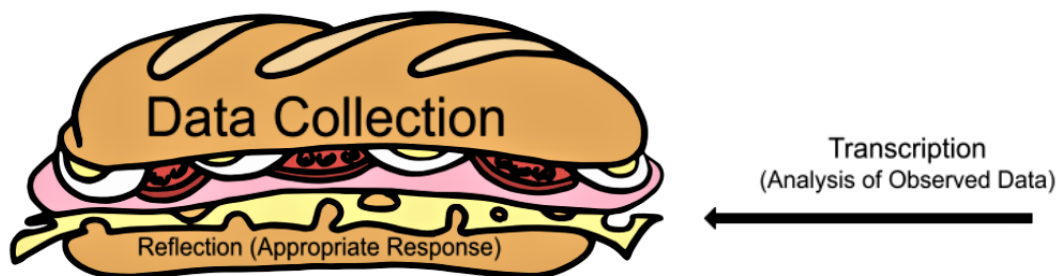


Figure 13

Graphic created by the author, Julie Seal

Bouting in Fencing Transcription Therapy

The preparation that comes before the fencing should be intentional, and continue in a manner most suited to each individual person. Although fencing a bout can be the initial motivation, it doesn't have to be the most important aspect of Fencing Transcription Therapy. *The process is the therapy.*

That being said, when the HAQ individual is prepared, bouting with a partner provides that opportunity for transcription and cognitive development where true communication can happen. Fencing encounters are often referred to as “a conversation,” and that is the hope for the HAQ participant as well.

For bouting, there are three traditional fencing weapons. Epee is possibly the best weapon for beginning HAQ fencers. Whichever fencer hits the other first scores. If both fencers hit simultaneously, both score a point until the final point of the bout which must have only one fencer score. The feedback is direct and clear. Epee fencing suits the needs for HAQ individuals and transcription.

Aspects that may warrant special attention during bouting include: sportsmanship and etiquette. Since HAQ minds often show an affinity for ritual behavior, facilitators and coaches can use the ritual aspects of fencing as benchmarks for positive feedback. Compliments on remembering to salute, shake hands, acknowledge points, etc. provide data and reinforce behavior. They are goals that do not require athletic achievement but do provide a sense of accomplishment and correctness, and can add to self esteem.



Figure 14

Autistic individuals participating in a fencing therapy session in collaboration with local occupational autism therapists.

Autistic Individuals and Teaching Others to Fence

In a typically socially interactive situation, HAQ individuals may not feel like they have much to offer others. They may not even realize that others need assistance at all, ever. Fencing offers a unique opportunity to become a teacher. Fencing is such a niche activity that it can offer participants a set of skills that are not common and therefore make the fencer unique. For neural atypical people, being in a position that can help others might be rare. But feeling like one has value to offer to others in a community is a key aspect of well being and meaningful involvement. Beyond this obvious boon, a teaching opportunity in concert with the Collection-Transcription-Reflection method of empathetic cognitive development, HAQ participants can foster value in connection.

Teaching can benefit the instructor. As Farrelly et al. (2015) demonstrate with their research:

Studies show that when people think about helping others, they activate a part of the brain called the mesolimbic pathway, which is responsible for feelings of gratification. Helping others doles out happiness chemicals, including dopamine, endorphins that block pain signals and oxytocin, known as the tranquillity hormone.

The work of psychologist Eva Ritvo (2014) furthers this argument by showing the benefits of empathy, which occurs through the work of mirror neurons and the release of oxytocin. As a HAQ individual experiences these physical benefits while teaching and reflects on them, it should reinforce a more empathetic approach.

Thus, by coaching, using the macro-physical exercises described above, fencing can offer HAQ individuals a way to develop greater empathy and interpersonal function.

A collaboration then, of the fencing community and the Autism community, might be of benefit to Autistic individuals looking for a fresh innovative approach. But the Autism community may not be the only big benefactors of such a suggestion. The fencing community as well might benefit from the Autism community, and not just by providing the Fencing world a more service oriented role in society. It is possible that Broader Autistic Phenotypes have been the source of successful fencing athletes, all along. The expanding definitions of the Systemizing Brain, and BAP indicate that individuals who already excel/prefer quantifiable information may be already present in a sport where they might find instant success and refuge from more empathetically oriented activities.

Feedback from Autistic Participants using Transcription Therapy

A range of Autistic individuals participated in all portions of Transcription therapy exercises above, including bouts sessions. Informal interviews were conducted before and after the sessions to determine whether the activity was helpful to them and productive for their goals. Additionally, accompanying therapists and parents were interviewed. For both parents and therapists, they were generally overwhelmed with the engagement level and fencing's ability to keep the participants focused and excited. Early in discussion, prior to the fencing sessions, there was concern over whether subjects would be impeded by the equipment to the level that they would not want to participate. It was decided to move forward with observation and attempts to help subjects resolve their concerns as part of the therapy. Some subjects were not able to tolerate the full set of equipment and for those individuals, foam weapons and eye protection were used. Exercises like mirroring, that did not require equipment, were very popular with the participants. They enjoyed the simple aspects of the exercise objectives and became very creative within the scope of the activities. The participants were smiling and did seem to connect with their partners well. In the post activity interviews, both parents and therapists alike expressed that engagement and fun were the number 1 and number 2 objectives in their opinions.

Participants that were able to use full fencing gear used sabers for non-electric bouting and epees for electric bouting. Although both weapons provided engagement and all participants said they had fun, electric epee bouting accomplished the processing and interaction therapeutic goals. One therapist remarked that it was the first time he had seen one of the participants (who had a higher AQ and was generally more withdrawn) seem confident and present. Another participant, who suffered from physical sensitivities such that he would wrap his feet in plastic wrap and gauze before donning slippers (OCD) was determined to fence. He remained highly involved and hungry to learn more throughout the session.

Younger participants (under 10) seemed to have the hardest time managing putting on the equipment and staying focused. All participants were able to remain interested and engaged for an average of 30 minutes per session. A great deal of time before the session was needed to select equipment that would be emotionally satisfactory for each individual. Perhaps new, personal equipment may be the best approach.

Parents remarked that fencing was the first activity other than video games that their children would even agree to participate in. They seemed optimistic about their child's continued involvement and how fencing could help benefit. The therapists who participated specialized in occupational therapy and were very excited to see the engagement of the participants. A longer term relationship between their professional group and fencing is under discussion.

Part III: Is Broader Autism Phenotype Already Disproportionately Present in Fencing?

Examining the potential of a collaboration of the fencing community and the Autism community lead to additional questions for consideration: Is it possible that HAQ individuals have already contributed to fencing? Is the sport of fencing populated with higher systemizing cognitive athletes also known as Broader Autism Phenotype (BAP)?

A study was conducted to gain data in answer to these questions. The working hypothesis was that members of the fencing community may show a higher AQ in comparison to a control group of non-fencers.

Methods

Participants

300 individuals were recruited via social media over two months (March-April, 2021) to participate in the study.

Group 1, the target group, was composed of fencers exclusively: 173 participants total. Group 1 self-selected through a fencing community social network.

Group 2, the control group, was composed exclusively of non-fencers. Group 2 self-selected through a broader set of social networks. Recruitment occurred via

Facebook, Instagram, and word-of-mouth referral by participants. Group 2 was comprised of 127 individuals.

Methods

Participants were administered two different online surveys, depending on the participant group. Survey 1 “Fencing Brain Calculator” was created by the author. See Appendix A for the full set of questions. Survey 2 “System vs Empathetic Brain Calculator.” See Appendix B for the full set of questions. Both surveys were constructed of questions based on the research Baron-Cohen et al. (2001) and others (Psychology Tools, 2021). The purpose of administering the surveys was to determine whether members of the fencing community may show a higher AQ in comparison with the control group of non-fencers.

Each survey was administered to two different groups. Group 1 received Survey 1 “Fencing Brain Calculator.” Group 2 received Survey 2 “System vs Empathetic Brain Calculator.” The survey was shared via social platform sharing, i.e. Facebook. Respondents completed the survey via Google Forms.

The only key differences between the two surveys were the exclusion of fencing related background questions (Questions 1-7 on Survey 1, Appendix A), such as inquiries regarding how many years fencing, rating, and fencing success, for Group 2. However, all participants were asked minimal sport participation questions such as “Do you play sports at a high competitive level?” (Q2). The purpose of this question was to question if possible further research might be beneficial in sports participation at large and autism. To clarify, however, this question was included for later possible data mining and not necessarily in direct relation to the specific survey application.

Measurements

All participants were asked minimal sport participation questions such as “Do you play sports at a high competitive level?” (Q2). The fencers group (Survey 1) differed from the general population group in the much higher percentage (80.9%) that played sports at a high competitive level (Figure 15). The control group of non-fencers significantly differed from the subject group in the level of sports participation, for which a much lower percentage (10.2%) played sports at a high competitive level (Figure 16). This was a large difference between the two groups.

Figure 15 – Subject Group (Fencers, Group 2) Responses to Q2 – Do you play sports at a high competitive level?

2. Do you play other sports at a high competitive level?

173 responses

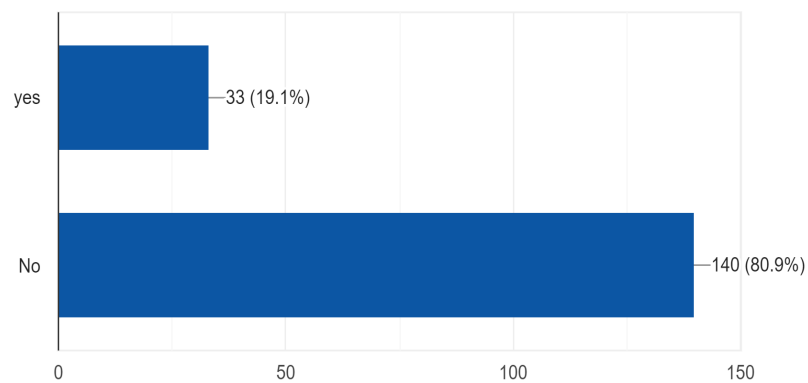
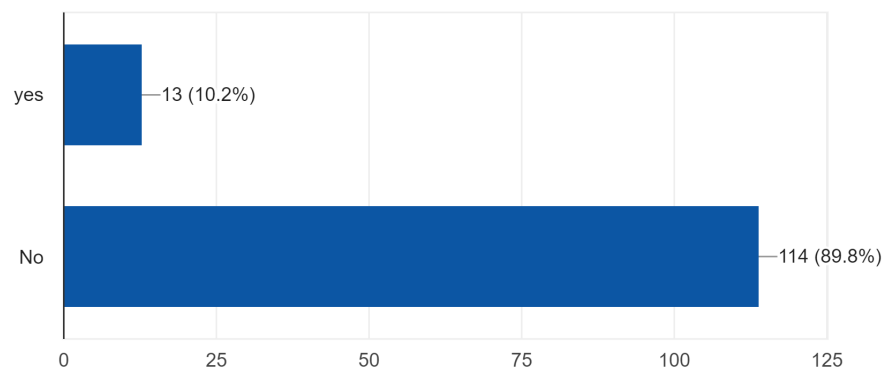


Figure 16 – Control Group (Group 2) Responses to Q2 – Do you play sports at a high competitive level?

2. Do you play sports at a high competitive level?

127 responses



Of the two Groups, both showed Quotients scoring in the relative center of the given scale of Empathetic-Systemizing. (Scores trending towards the high of 32 show Systemizing Quotients. Scores trending toward 0 show Empathetic Quotients.) Group 1 (the fencing group) scored a median of 14/32 possible points. Group 2 (the control group, or non-fencing sample) scored a median of 13/32 possible points or one point more empathetic than the fencing group (Figure 17, Figure 18).

Figure 17 – Individual Responses of Subject Group (Group 1) on BAP spectrum.

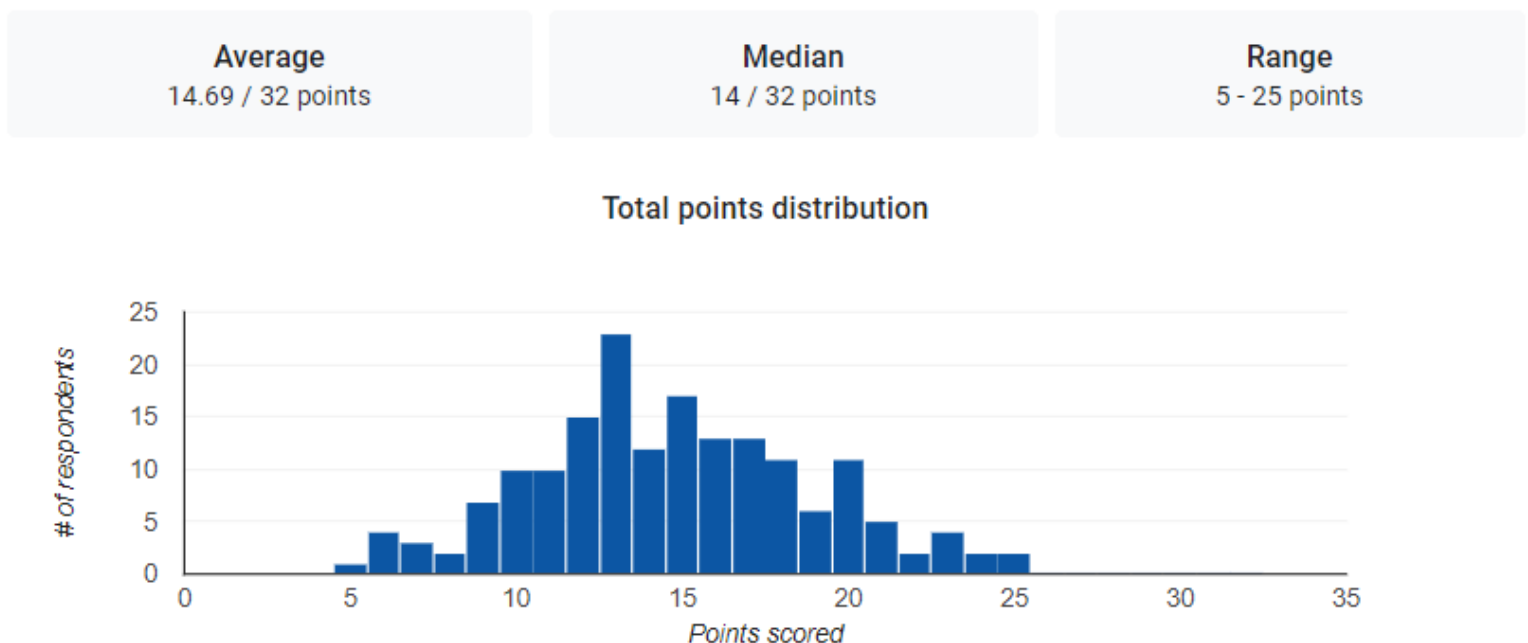
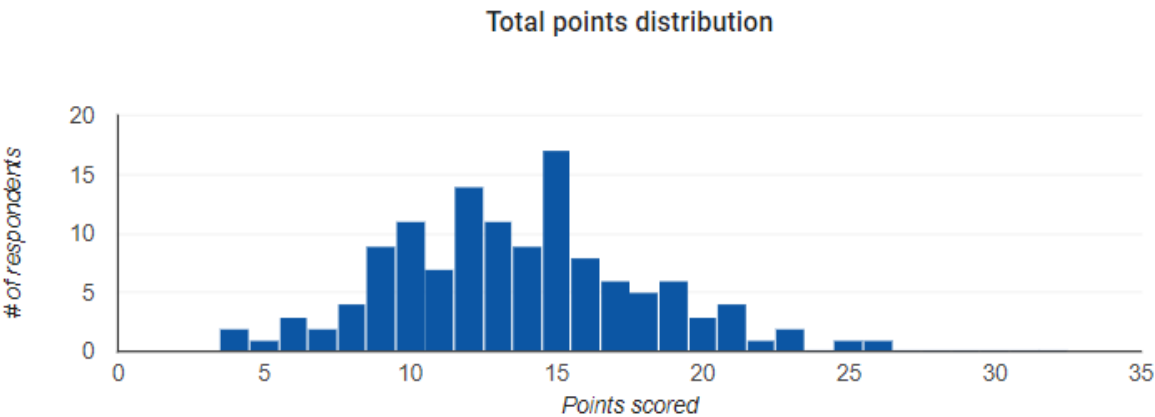


Figure 18 – Individual Responses of Control Group (Group 2) on BAP spectrum.

Y axis displays number of participants to answer each question with a response that is statistically more BAP consistent. X axis reflects how many BAP responses were generated per question.

Average 13.65 / 32 points	Median 13 / 32 points	Range 4 - 26 points
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Results

Group 1 (fencers) can be seen here as incrementally higher SQ than Group 2 (non-fencers) (Figure 19, Figure 20). While not on any clinical diagnostic level, it may be that upon further investigation higher instances of Broader Autism Phenotype (BAP) may be noted among the fencer group as a whole. Broader Autism Phenotype is recognized as showing greater affinity for Systematizing cognitive preference as opposed to Empathizing.

No real conclusions can be drawn from this small introductory survey. All that can be said conclusively is that for these two samples of either group, the fencing group was incrementally more systematizing than the control group.

Figure 19. Comparison of Fencers (Group 1) to Control Group 2. Group 1 (fencers) were incrementally more SQ > EQ

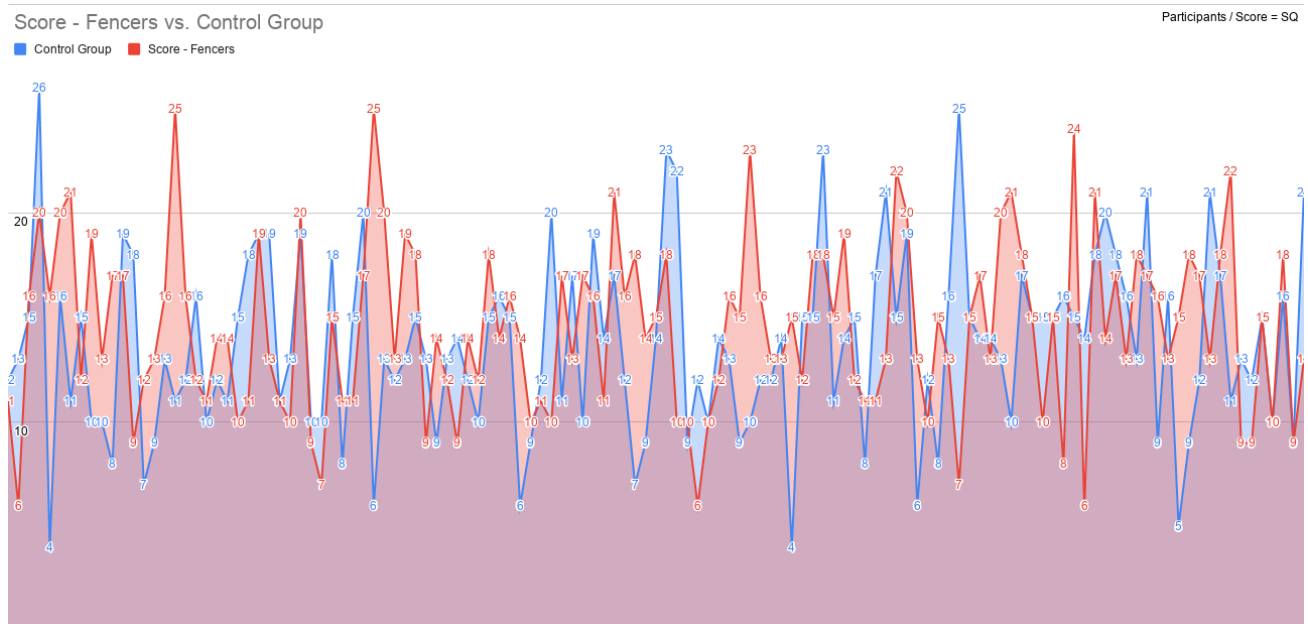
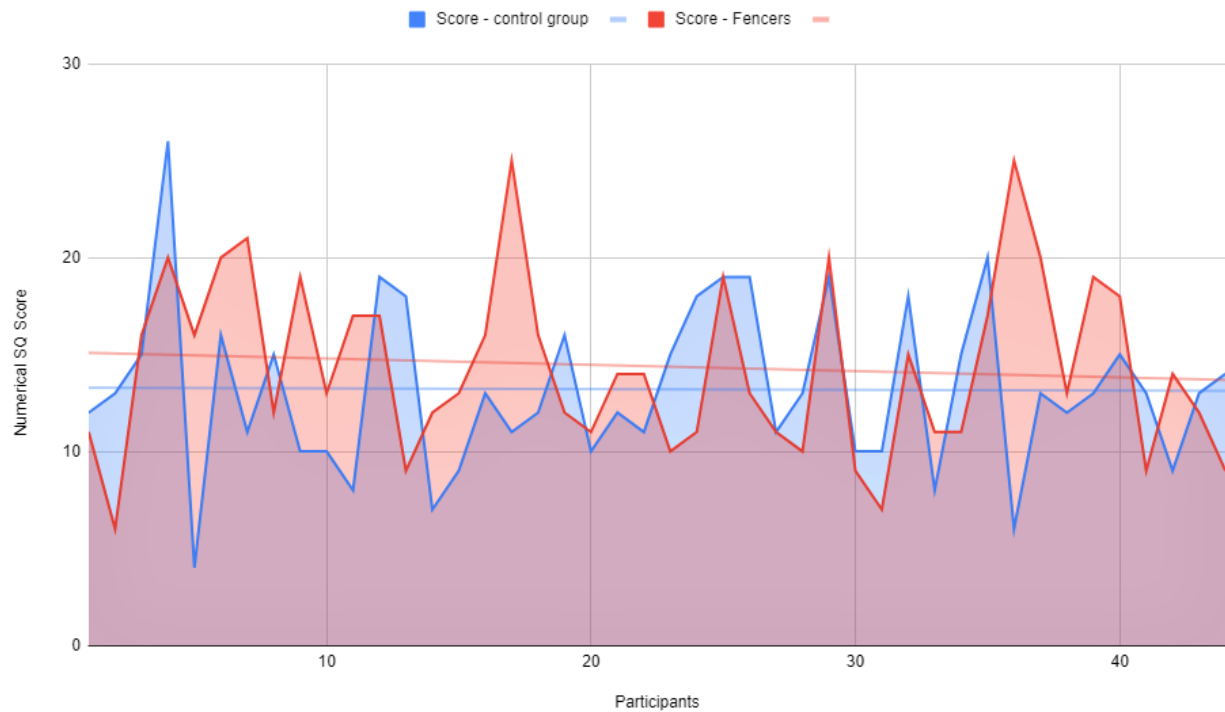


Figure 20. Zoom of comparison graph Group 1 to Group 2 for the given survey.

Autism Quotient Self Assessment



Limitations and Future Research Opportunities

More research will be needed to make a more useful analysis. Possible future research might include surveying groups of already diagnosed HAQ individuals to better compare with Groups 1 and 2. Additionally, because Broader Autism Phenotype is often correlated with family members who are clinically diagnosed with HAQ behaviors (Wheelwright et al., 2010), it may be of interest to question Groups 1 and 2 concerning siblings' and parents' cognitive status. Such information may add depth to results where one group scores marginally more or less than the other.

Combining more complete participant background data caches may provide insight where even small variances have greater meaning.

Certainly, follow up surveys will need a greater sample size.

Discussion

This survey was not administered in a strictly scientific method and therefore all results are subject to speculation. The survey results are presented merely as a suggestion toward athlete training/coaching design in consideration of cognitive predisposition. **If a higher tendency towards Systemizing Cognitive processing is present in the group of fencers as a whole, is perhaps this atypical neuro platform the secret to greater fencing success?** The data from this survey is not conclusive. Further research is merited.

We have previously discussed the positive value of fencing as a new applied therapy for individuals with autistic neural platforms (Autism Transcription Therapy). The introspective question these surveys inspire might be, what can autism teach fencing coaches about ourselves and our students? If fencers are even fractionally more quantitative in their thinking processes, can we better organize our pedagogical approaches to even better facilitate what natural talent and abilities students bring to fencing? Can we appeal even more to those abilities and mine exponentially greater success based on an athlete's cognitive inventory and quantitative analysis super powers?

Conclusions

Therapies for conditions related to Autism and related Autism Spectrum Disorders (ASD) are still emerging and open to mining skills and resources that might be provided by recreational activities like fencing. Fencing can provide avenues that might increase connection between the brain and bodily coordination. Fencing can possibly increase the participant's ability to connect with other individuals by limiting the amount of subconscious communication normally present in otherwise everyday activities. Using fencing masks, ASD participants reduce microcommunication associated with facial expressions that are often misinterpreted, if they are registered at all. Using macro expressions like fencing actions, ASD participants can practice communication and engagement with others in a limited, concise fashion. Further, participant expectations are preset regarding the spectrum of responses (i.e. parry riposte, counter attack, etc.).

This limited, multiple choice style of response therapy reduces anxiety and unreadable informational feedback, and targets the brain to develop appropriate collection, analysis and interaction. This process can be called "Transcription Therapy." The key tenets of Transcription Therapy are 1) Collection 2) Transcription 3) Reflection. The purpose of this fencing inspired therapy is to hone the individual's ability to transcribe physical data into recognizable signals that can be mentally catalogued and inventoried to fashion logical, recognizable responses for neurotypical associates and therefore improve interpersonal interaction.

The broader application for the ASD individual would be to develop a cognitive skill that might later improve the brain's ability to also recognize and catalogue the physical signals generated in facial expressions. The approach recognizes the Systemizing nature associated with ASD function, and uses that cognitive platform's strengths to promote social and societal success for that individual.

A survey was given to a limited sample of fencers to determine if athletes involved in the sport might have Broader Autism Phenotypic characteristics. This was done to consider whether fencing might attract higher Systemizing Brain participants as a general observation. The survey followed established formats created by experts at Cambridge University, developed by principles derived from research by Simon Baron Cohen and others in the field of Autism. The results might have application in understanding what cognitive platforms find success in fencing, and whether fencers might naturally serve as ambassadors between individuals with higher Empathetic brains and those with non-neurotypical Systemizing brains. This cognitive range skewing toward Systemizing is commonly referred to as Broader Autism Phenotype. The survey results showed a slightly higher “systemizing quotient” (SQ) for fencing participants. This result might be amplified with larger samples.

These results may merit a secondary survey to determine if greater prevalence for Broader Autism Phenotype exists in the highly systemized sport of fencing. If subsequent research confirms a high BAP percentage among fencers, it may strengthen the notion that fencing as a sport can indeed benefit from recruiting athletes with a naturally high SQ. Perhaps using more tools like the Cambridge Personal Styles Questionnaire (Cambridge University Press & Assessment, 2021) might be helpful in creating new and innovative coaching approaches that can utilize previously untapped, unrealized talent. Further, fencing may indeed be able to offer a new “outside of the box” therapy for individuals seeking to better practically integrate and function in a more empathizing world.

Perhaps non-neurotypical challenges require non-neurotypical solutions? Maybe fencers are just non-neurotypical enough to bridge the gap. Further research into the impact of SQ-aware fencing training, and surveying the fencing population as a whole, could help fencing coaches and those working with Broad Autism Profiles improve their practice and help more individuals become successfully involved in the sport.

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Appendix A

Fencing Brain Calculator

<https://forms.gle/b4DaCjDyJxoXeogd7>

Fencing Brain Calculator

This assessment is meant to roughly estimate your emotional vs. systemizing value in your brain's processing and social function. Your answers are anonymous. The results will be studied to determine if there exists a pattern of cognitive organization among fencers, which may have drawn you to the sport of fencing, or contributed to your enjoyment, participation, and success.

The first 7 questions are merely for the purposes of performance tracking as it may be relevant to the total sample results and their use and application. They do not serve to map organizational/processing values of the brain. Please answer all of the questions to the best of your ability. You may change your answers at any time as long as you change them before you submit the test at the end. You may discuss the questions with anyone around you if it helps you to honestly determine the answer. Think about the questions as they may apply to a couple of different situations or scenarios to more accurately determine your inclination.

*All questions required a response

Email

1. Main Weapon

Foil

Saber

Epee

2. Do you play other sports at a high competitive level?

yes

No

3. Have you placed 8th or higher in a National USA/Foreign Country competition?

Yes

No

4. Have you placed 8th or higher in a World Cup Competition?

Yes

No

5. Have you won a national fencing title?

Yes

No

6. Do you have a USA Fencing rating?

A rated

B rated

C rated

D rated

E rated

Unrated

World ranked

7. How long have you been fencing?

Less than 2 years

Less than 5 years

Between 6-10 years

Longer than 10 years

Fencing Brain Type Calculator

8. I love to find a way to do things and then stick to that method. 9. People say that my choice of words are blunt.

10. In a social setting, I can easily keep track of several conversations at once.

11. I like parties.

12. I am extremely detail oriented. I like things done a specific way.

13. I don't like tailoring conversation to what other people like talking about. I am more interested in talking with others who want to discuss what I am interested in.

14. I love chit chat.

15. I am fascinated by stats, and metrics.

16. I prefer nonfiction to fiction.
17. I would prefer the theater to the museum.
18. I am good at sensing how people are feeling.
19. I love to be spontaneous.
20. I often get sidetracked many times in doing a task.
21. I feel like new situations are exciting adventures.
22. When I was young, I love to play pretend games.
23. I am good at remembering birthdays.
24. I notice and often get bothered by small noises that others don't readily worry about.
25. I tend to develop strong, narrow interests that I get fixated on for periods of time.
26. I notice patterns all the time.
27. I have a routine that I follow everyday or for specific activities.
28. I usually miss small changes in the appearances of others (i.e. a new haircut, getting braces)
29. I prefer multi-tasking. Focusing on one thing at a time makes me freeze up mentally.
30. I have an immediate biological family member who has been diagnosed with Autism Spectrum Disorder or an associated condition such as ADHD, Asperger's, or OCD.
31. I sometimes get so lost in my thoughts that I don't hear people speaking to me or saying my name.
32. Texture is the most important aspect of a food.
33. I feel like I appropriately experience and convey compassion and empathy.
34. I can organize and express my emotions verbally and completely.
35. I often understand and describe objects, concepts and activities with numbers such as statistics, measurements or dates.

36. I am at ease when people are emotional around me, or express intense emotion at me.
37. People say I am "touchy/feely" and I am a huge hugger.
38. I love role playing games, like Pokemon, Dungeons & Dragons & Magic the Gathering.
39. I often provide more information that is more than was requested, if I have the answers.
40. Would it have bothered you if this test stopped with 39 questions, instead of an even 40?

Questions 8-40 response options were:

Yes	No
-----	----

"Yes" answers resulted in one point scored for Systematizing on a scale of 0 to 32. 32 points equalled most Systematizing.

"No" answers resulted in no points scored for that question.

Fewer points equaled more Empathizing. Zero points equalled most Empathizing.

Appendix B

Systematic vs. Empathetic Brain Calculator

<https://forms.gle/cswfhysdE9CLT88e7>

People say that my choice of words are blunt

In a social setting, I can easily keep track of several conversations at once.

I don't like tailoring conversation to what other people like talking about. I am more interested in talking with others who want to discuss what I am interested in.

I love chit chat.

I am fascinated by stats, and metrics.

I prefer nonfiction to fiction.

I am good at sensing how people are feeling.

I love to be spontaneous.

I feel like new situations are exciting adventures.

When I was young, I loved to play pretend games.

I am good at remembering birthdays.

I tend to develop strong, narrow interests that I get fixated on for periods of time.

I usually miss small changes in the appearances of others (i.e. a new haircut, getting braces)

I prefer multi-tasking. Focusing on one thing at a time makes me freeze up mentally.

I have an immediate biological family member who has been diagnosed with Autism Spectrum Disorder or an associated condition such as ADHD, Asperger's, or OCD.

I sometimes get so lost in my thoughts that I don't hear people speaking to me or saying my name.

Texture is the most important aspect of a food.

I feel like I appropriately experience and convey compassion and empathy.

I can organize and express my emotions verbally and completely.

I often understand and describe objects, concepts and activities with numbers such as statistics, measurements or dates.

I am at ease when people are emotional around me, or express intense emotion at me.

Would it have bothered you if this test stopped with 39 questions, instead of an even 40?

Question response options were:

Yes	No
-----	----

“Yes” answers resulted in one point scored for Systematizing on a scale of 0 to 32. 32 points equalled most Systematizing.

“No” answers resulted in no points scored for that question.

Fewer points equaled more Empathizing. Zero points equalled most Empathizing.

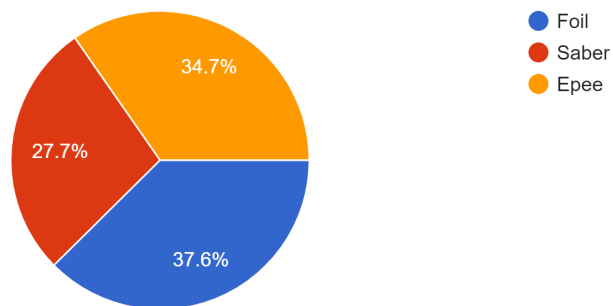
Appendix C

Responses to demographic questions of Fencing Brain Calculator (Survey 1, Appendix A).

Fencing Sample (Group 1) Fencers exclusively.

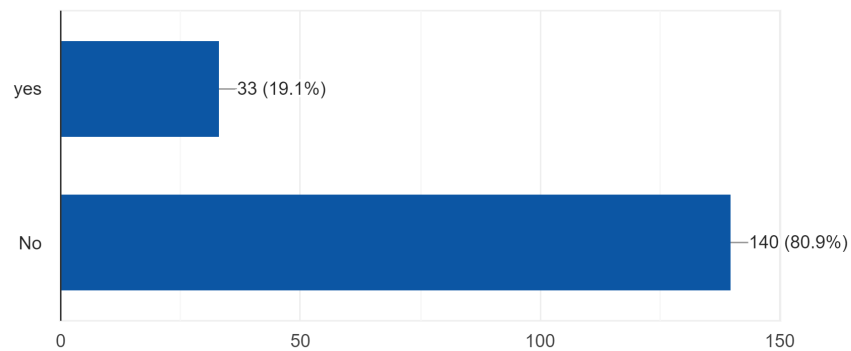
1. Main Weapon

173 responses



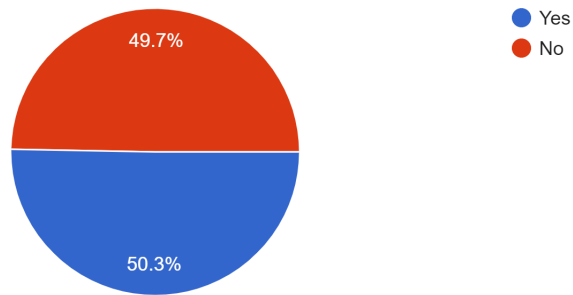
2. Do you play other sports at a high competitive level?

173 responses



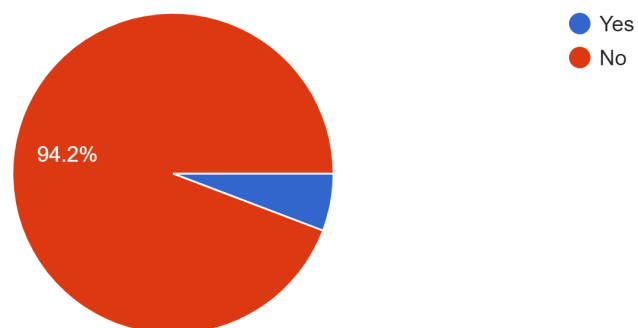
3. Have you placed 8th or higher in a National USA/Foreign Country competition?

173 responses



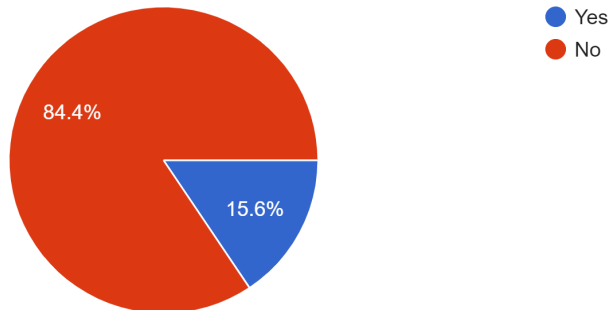
4. Have you placed 8th or higher in a World Cup Competition?

173 responses



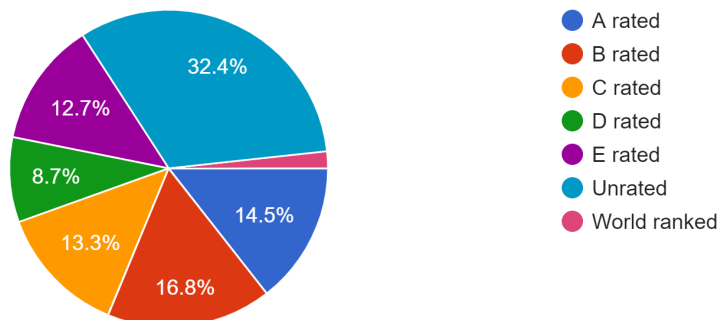
5. Have you won a national fencing title?

173 responses



6. Do you have a USA Fencing rating?

173 responses



7. How long have you been fencing?

173 responses

