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# Motivation in Athletes With and Without Autism Spectrum Disorder: Sq, Eq and Aq Relationships to Preferred Feedback

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**MOTIVATION IN ATHLETES WITH AND WITHOUT AUTISM SPECTRUM  
DISORDER: SQ, EQ AND AQ RELATIONSHIPS TO PREFERRED FEEDBACK**

by

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**SUBMITTED TO SCRIPPS COLLEGE IN PARTIAL FULFILLMENT  
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## Abstract

All athletes are driven by motivation, sources or reasons to push their bodies to their limits and continue to do so regularly. There have been several studies concerning motivation in typical athletes, and many regarding social motivation in people with High Functioning Autism (HFA), however most have been limited to children, and there have been no investigations into HFA athletes' motivation. The current study looks into the role of social dimensions in athletics, and tests how one's gender and placement on the Empathy Questionnaire (EQ), Systemizing Questionnaire (SQ), and on the Autism Questionnaire (AQ) affect intrinsic motivation in athletics. It was predicted that athletes with HFA would demonstrate greater levels of intrinsic motivation than those with lower scores on the Systemizing and Autism Questionnaires. The second hypothesis predicted that those who are more prone to systematizing (and perhaps higher on the AQ) would be more intrinsically motivated than those who are more prone to empathizing, as social rewards may not be as important to them. To uncover the differences between intrinsic motivation due to placement on the AQ, SQ and EQ, as well as differences between sexes and coaching feedback, a combination of Linear Regression Analyses, Independent Groups T-Tests and Correlations (n=25) were used. The first hypothesis was invalid due to lack of recruitment of HFA participants, but the second was supported by the data. *Keywords:* autism, systematizing, empathy, athletics, motivation

## I. Introduction of Introduction

Knowledge about general motivation in Autism is often tested utilizing scales such as the Empathy Questionnaire (EQ) and the Systemizing questionnaire (SQ), which classify people on a spectrum based on their perceived abilities to empathize and systemize.

Those on the autism spectrum tend to have a high SQ and low EQ, as opposed to neurotypical men and women who have more level scores, with women tending to have higher EQ and men tending towards higher SQ. These scales have yet to be utilized in developing effective support systems or teaching styles depending on different abilities. The current study will look into the role of social dimensions in athletics, and test how one's gender and placement on the EQ, SQ, and on the Autism Questionnaire impact intrinsic motivation in athletics (does one's position on the autism spectrum factor into how they prefer to interact and train?). Considering that Autism affects both social cognitive processing (social rewards processing and motivation) and processing of local/global aspects of stimuli (high processing of local, systematic aspects, low processing of global aspects, resulting in a rigid scope), it is predicted that athletes with HFA will demonstrate greater levels of intrinsic motivation than those who score lower on the Systemizing and Autism Questionnaires. In addition, it is predicted that those who are more prone to systematizing (and perhaps higher on the AQ) will be more intrinsically motivated than those who are more prone to empathizing, as social rewards may not be as important to them. This study may provide insight into future coaching techniques in training different types of athletes. A way to further this study is to then find out what feedback athletes would prefer to hear from their coaches, and see where their preferred feedback relates to their placement on the Autism Spectrum.

## **II. Autism Spectrum Disorders and High Functioning Autism**

The Diagnostic and Statistical Manual (DSM-4) for Mental Disorders is the most commonly used tool to determine whether a person has an autism spectrum disorder. DSM-4 criteria for a diagnosis of autism requires a total of six or more items from headings (A), (B) and (C), with at least two from (A) and one each from (B) and (C). Commonly referred to as the triad of Autistic symptoms, the category (A) represents qualitative impairments in social interaction, (B) represents qualitative impairments in communication, and (C) is restricted repetitive and stereotyped patterns of behavior, interests and activities (DSM-IV, 2004). Qualitative impairments in social interactions include marked impairments in use of nonverbal behaviors, such as eye-to-eye gaze, body posture, facial expression, gestures, inability to develop peer relationships appropriate to developmental level, lack of seeking to share enjoyment, interests, activities with other people, lack of social or emotional reciprocity. In regards to qualitative impairments in communication, delay or lack of development of spoken language, marked impairment in initiating or sustaining conversations, stereotyped and repetitive use of language or abnormal, idiosyncratic language, or lack of social imitative play appropriate to developmental level all may be indicators of an Autism Spectrum Disorder. Lastly, restricted repetitive and stereotyped patterns of behavior may include an obsession with something that is abnormal in intensity or focus, inflexible adherence to nonfunctional routines or rituals, stereotyped and repetitive motor mannerisms (such as snapping or twisting fingers), or persistent preoccupation with parts of objects. Another stipulation of having an Autism Spectrum Disorder is displaying delays or abnormal functioning (all outlined above) prior to 3 years-of-age.

Most people with Autism enjoy certain forms of active physical contact and show attachment, on a simple level, to parents or caregivers. Besides these basic forms of social interaction, those with Autism Spectrum Disorder (ASD) cannot maintain conversations. They are unable understand that language is a tool used to exchange information with others. Even those who are capable speakers and have a strong grasp of language often talk at people, not with them. Referred to as Joint Attention, people with autism are unable to “coordinate attention between interactive social partners with respect to objects or events, or to share an awareness of the objects or events” (Dawson et al., 2002). In this population, there is a tendency for people with ASD to pay attention to trivial things rather than seeing a scene as a whole (ie: attending to a wheel rather than the entire train), which does not serve well in social situations. Due to this imagination impairment, those with ASD often have a very narrow range of repetitive activities (Lord et al., 2000).

The main focus of the study centers on individuals with High Functioning Autism (HFA). HFA differs from other autism spectrum disorders because of its relative preservation of linguistic and cognitive development. Those who are diagnosed with HFA often display physical clumsiness and atypical (peculiar) use of language, as mentioned in criteria above (McPartland and Klin, 2006; Baskin, Sperber and Price, 2006). HFA has been defined by an IQ of 70 or higher, but there is no consensus on the definition. Both the DSM-IV-TR and the ICD-10 do not recognize HFA as its own diagnosis, but it is commonly used by people as a label for their placement on the Autism Spectrum. HFA is sometimes recognized as synonymous with Asperger Syndrome (AS), but just as often it is viewed as exclusive of AS. Both individuals with HFA and AS

exhibit communication, emotional recognition, and expression deficits (Sanders, 2009). As aforementioned, those with AS/HFA tend to have specific and narrow areas of interest that they pursue (McPartland and Klin 2006). Individuals with this diagnosis are detail oriented, without necessarily understanding the broader topic. They may know names of all stars, but not know the reasons or functions of them (McPartland and Klin, 2006; Klin, 2006). Language acquisition and its use is often atypical in those with AS/HFA. Individuals on the spectrum may be verbose, lack transitions, interpret everything literally, and may misunderstand nuance, metaphor and simile, or figurative language. They may speak formally, idiosyncratically, or speak with odd intonation or unusual rhythm, pitch or loudness (McPartland J, Klin A, 2006). AS/HFA is commonly associated with alexithymia, difficulty in identifying and describing one's emotions (Fitzgerald and Bellgrove, 2006). Prevalence is not firmly established for either Asperger's or HFA, as the distinction between the two is unclear.

In the DSM-5, Asperger's is replaced by a diagnosis of autism spectrum disorder on a severity scale (*DSM-5 Development* American Psychiatric Association, 2010). The severity scale was introduced as a means of addressing the difficulty of attributing a set list of symptoms that define ASD. Though social deficits are apparent, every individual demonstrates a different combination of symptoms (National Autistic Society, 2001.) As adults, individuals with ASD may be fully independent and successfully employed, or may be completely dependent and mute. There is a huge range of labels within the autism spectrum (ie Rett's, Asperger's, and PSOD).

### **III. Cognitive Theories of Autism**

Autism was discovered by Leo Kanner and Hans Asperger in 1943/44. Over the decades, researchers have theorized a variety of explanations for the cause of the

disorder. Bettelheim (1967) attributed it to an emotionless mother. Frith, Prior Rumsey, Hermelin and O'Connor (1960s and 70s) purported that ASD was caused by impairments in perception, memory and language development. Many researchers centered their studies around disordered language in autism, which is regaining momentum today (Ricks & Wing, 1976). In the mid 80s, it was hypothesized that Autism was the consequence of a primary cognitive deficit. This was then refined and became known as Theory of Mind (Rajendran, 2007).

Theory of Mind, Theory of Executive Dysfunction, and Social Motivation theory are three of the most influential theories on autism to date. Theory of Mind states that those with autism cannot accurately understand others' mental states, nor express their own (Premack & Woodruff, 1978). It is related to the proper functioning of the mirror neuron system, a mechanism of the brain that is normally active while both actions done by the self are performed and when those done by others are performed (Oberman, Pineda, & Ramachandran, 2007). The MNS is responsive to both apparent kinesthetic actions and those which are not apparent to the eye, such as intentions behind the actions. This mechanism is postulated to be impaired in people with Autism. This is exemplified in a study by Castelli et al. (2002), which used a mentalizing network (medial prefrontal cortex, superior temporal sulcus at the temporoparietal junction and temporal poles), and lead PET scans to look for activation in those areas. Researchers utilized the 'triangles task,' an animation of three different types of movement of triangles, to test for activity. During the animations, PET scans and MRIs were performed. In between each animation, the participant was asked what they saw. It was found that the Asperger's group showed less activation than the normal group in all of these regions. In addition, the Asperger's

group gave fewer and less accurate interpretations of animations that elicited mentalizing. Prior studies (ie: Baron-Cohen et al. 1999, 2001) had also shown that people with Asperger's less accurately used mental state descriptions, and this study reconfirmed that individuals with autism spectrum disorders have impairment in attribution of mental states. Deficits in Theory of Mind and social motivation, addressed below, have led to observed deficits of imitation, noticeable throughout lifespan (Dapretto, 2005).

Theory of Executive Dysfunction is a more generalized deficit in cognition. Executive Dysfunction involves impairments in initiating, sustaining, shifting, inhibition, stopping and motor sequencing tasks in general (Denkla, 1996). Executive functioning is often referred to as problem-solving, which involves flexibility and planning ahead, both of which individuals with Autism struggle to do. Cognitive flexibility is a cornerstone of executive functioning, defined as "the ability to shift to different thoughts or actions depending on situational demands" (Monsell, 2003). Those with ASD are rigid and have difficulty with straying from routine. Cognitive ability deficits are related to this, but may not be consistent with different tests, ie: TMT, and MCST (Hill, 2006; Lopez, 2005). As is the problem with most research done on ASD, results vary greatly from person to person.

The Executive Functioning Theory is strong in that it addresses many symptoms of autism, both cognitive and motor (Geurts, 2009). However, this theory is difficult to apply because it is almost too much to take into account at once (O'Neill and Jones, 1997). Adding even more complexity to a rich theory, the Executive Functioning Theory has many tenet theories, one being Weak Central Coherence theory. Firth proposed that ASD is characterized by Weak Central Coherence, a fault in processing incoming

information ‘in its context.’ Those with ASD often have weak memory for detail, and often show a preoccupation only certain parts, not the concept as a whole. They don’t have a conception of the ‘big picture’ (Happe, 1999). This theory complements Theory of Executive Dysfunction as it explains the reasons why people with ASD are so rigid and routine oriented, and unable to converse ‘normally.’

Social Motivation Theory posits something altogether different. According to its philosophy, ASD is akin to an “extreme case of diminished social motivation,” and those with the disorder are not driven to seek acceptance and avoid rejection like their neurotypical peers (Chevallier, 2012). Rather than the widely accepted conjecture that deficits in social cognition cause motivational deficits, Social Motivation Theory posits that deficits in social cognition are caused by motivational deficits. As exemplified in a study by Geurts and Hilde (2008), in comparison to typically developing children and those with ADHD, children with ASD did not exert ‘sufficient cognitive control’ when motivated. That is to say that they either chose not to or were unable to engage in the experiment, despite multiple [social] incentives.

Social motivation has many explanations, but most simply can be narrowed down to how an individual ‘preferentially orients’ to the social world, and how they maintain and develop relationships. Evolutionarily, social motivation works to help one adapt to and survive in an environment that requires collaboration. Biologically, evolutionarily, and in terms of social orientation, Social Motivation Theory makes sense. At the biological level, social motivation is determined by the interaction of the amygdala, ventral striatum, and orbital and ventromedial regions of the prefrontal cortex. This system is responsible for facial recognition, social approval, and social rejection. The

right hemisphere is known to be responsible for global, integrative and context-sensitive processing. Those with ASD demonstrate many of the issues that surface with right hemisphere injuries, such as ‘piecemeal processing’ and repetitive stereotyped behavior. This is unclear based on the little research that has been done on the topic (Happé, 1999). It is also unclear whether there is a general dysfunction in reward processing in autistic people, or a specific dysfunction in social reward processing. In Dichter’s 2010 fMRI study, brain activation during anticipation and response to different incentives was assessed. Those with ASD proved to be less responsive to money and people, but rather to object incentives. Similar findings were concluded in research done by Kohls and Gregor (2011), as participants with ASD showed activation in the reward system with monetary, tangible incentives, but none when presented with social rewards.

At the evolutionary level, those who can best adapt to their surroundings are the ones who will survive and pass on their genes. As part of the climate, people need to cooperate and work with each other to survive. By being part of a group, an individual benefits by achieving and creating things they could not do by their self (Tomasello, 2010). Behaviorally, people with ASD develop impairments in social attention when they are young. The impairments lead to the disruption of motivation developmental processes, which hinder people with ASD from engaging in, growing and learning from ‘normal’ social experiences. Due to all of these factors, social skill and social cognitive development are stunted (Dawson, 2005; Osterling, 2002). One of the processes disrupted by early onset impaired social attention is social orienting. Individuals with ASD are generally aloof, typically do not make eye contact with people, and often don’t respond to their own name. In one study, half of an adult population with ASD reported having no

friends, yet did not experience any greater loneliness because of this (Howlin, 2004; Chamberlain, 2007). On a friendship questionnaire in the same study, adults with ASD reported to have less enjoyment from social interaction and friendships (Baron-Cohen, 2003). Because of all of these social issues, those with ASD tend to be less responsive to verbal praise (Demurie, 2007) and rarely, if ever, take initiative in social circumstances.

While Social Motivation Theory has many logical appeals, there are a few shortcomings as well. It fails to address non-social deficits in ASD, such as repetitive behaviors and restricted interests, or co-morbid disorders, like anxiety and depression. The theory is also widely applicable to many other conditions, such as schizophrenia. However, these are only faults if one considers there to be a single explanation behind ASD. In direct contrast to Social Motivation Theory, O'Connor (2008) demonstrated in her study that atypical behaviors in ASD (repetitive activities, lack of communication and social skills) are more likely to be a consequence reflective of general processing difference than impairment in social cognition and/or motivation. In defense of Social Motivation Theory, the argument over whether there is an inability for those with an Autism Spectrum Disorder to do something versus a lack of motivation to do so has been a debate for decades, and will unlikely be solved soon.

Considering that those with Autism generally cannot accurately understand others' mental states nor express their own, and that according to Social Motivation Theory, those with the disorder are not driven to seek acceptance and avoid rejection like their neurotypical peers (Chevallier, 2012), it could be inferred that social motivation may not be reason to be a part of a team (in this case long distance track or cross country). Perhaps though, social motivation is seen in such a high degree on teams, that it

may be stimulating enough to appeal to athletes with Autism Spectrum Disorders. In accordance with Theory of Executive Dysfunction, lack of flexibility and planning ahead may make athletes with HFA more incentivized to keep running, especially with a team. The program often provides a constant schedule: stability, rigidity, structure; all things that are positive reinforcements to those with Autism Spectrum Disorders.

#### **IV. Use of Empathy Questionnaire and Systemizing Questionnaire for Autism Questionnaire**

Because autism is known to exist on a spectrum, attempts have been made to understand it on two primary axes: (1) primary engagement, and (2) preference for systematizing way of engagement, operationalized by Baron Cohen as the Empathizing Quotient and Systemizing Quotient.

Autism is characterized by difficulties in social development and communication, as well as obsessive and repetitive behavior (A.P.A., 1994; I.C.D-10, 1994). Generally, people display varying degrees of autistic traits, and the more severe are diagnosed with the disorder. The Autism Spectrum Quotient (AQ) is used to measure where an individual is on the spectrum (Baron-Cohen et al., 2001). This test is specifically intended for self-reporting adults with average IQ or above. This questionnaire should be considered only in the context of the Empathy Quotient Questionnaire (EQ) and the Systemizing Quotient Questionnaire (SQ) as these are also critical elements of ASD.

The Empathy Questionnaire (EQ), a self-report questionnaire, measures individual differences in empathy (Baron-Cohen and Wheelwright, 2004). Empathy is a vital component of social cognition, defined as the “drive to identify another person's emotions and thoughts, and to respond to these with an appropriate emotion” (S.

Wheelwright et al., 2006; Baron-Cohen, 2003). It is unknown how much empathy is inherited or nurtured, so drive and ability would both be apt terms for it. Empathy varies from individual to individual, as it runs on a spectrum. Sex differences in empathizing indicate that experiences, hormones, and genetics all factor into where one is on the empathy spectrum (Hughes and Cutting, 1999; Knickmeyer et al., 2005). It has been well established that ASD features reduced empathy (Izuma et al., 2011; Baron-Cohen, 2004), thus scores that indicate low empathy are also a potential sign of Autistic behavior.

The SQ, or Systemizing Questionnaire, is used as a broad test of interest in systems, rather than particular skills such as intuitive physics or mathematics. The need to 'systemize' is another trait of those with ASD (Baron-Cohen, 2002). It is defined as the drive to analyze, predict, control and construct rule-based systems. The process in systemizing is always the same, which appeals to those with Autism Spectrum Disorders. Systemizing is predictable: one element is treated as a fixed feature (held constant), and another element(s) are treated as variables (vary depending on different conditions). Simple observation of the consequences of the two elements allows one to learn about the system. Systemizing is finite, deterministic, and orderly. Systemizing is not useful in predicting moment-to-moment changes in a person's behavior (Baron-Cohen, Richler, Bisarya, Gurunathan, and Wheelwright, 2003). This is directly relevant to the tendency of those with Autism Spectrum Disorders to be inflexible and have trouble with empathizing. Thus, a high score on the SQ would be indicative of ASD, especially in combination with a low score on the EQ.

Sex differences are prominent in the SQ, EQ and AQ Questionnaires. The Empathizing-Systemizing (E-S) theory of typical sex differences (Baron-Cohen, 2002)

posits that more females have Type E (E N S) profile than men, and men are more likely to be Type S (S N E). The 'extreme male brain' (EMB) theory (Baron-Cohen, 2002) conjectures that those with ASD have Extreme Type S profile (S NN E), a hyper-masculine brain. Therefore, typical sex difference in the general population should not be encountered in the ASD population if the condition as a whole is marked by this profile. Considering that women perform better on the EQ and men perform better on the SQ, it is suggested that empathizing and systemizing are independent of each other.

Symptomatic of ASD are strong systemizing and impaired empathizing, which indicates a neurological relationship between the two.

#### **V. Motivation, Coaching and Athletes**

What drives sports is not different from any other achievement 'context.'

Participants all want to prove their competence (Baric and Bucik, 2009). Involvement in competitive sports affects self-esteem in a positive way (Kamal, Blais, Kelley, & Ekstrand, 1995; Taylor, 1995) as well as achievement attitudes (Butt & Cox, 1992; Curry, Rehm, & Bernuth, 1997). Motivation to participate in sports varies infinitely, from family traditions to staying in shape, from socializing to trying something new.

Self Determination Theory asserts that psychological needs, types of motivation and consequences interplay in one's motivation to exercise (cite). Individuals have three primary needs: self-efficacy (recognition that they are competent), autonomy (being able to make their own choices), and social attachment. Motivation is on a spectrum ranging from self-determined to extrinsic. In the middle is amotivation, which is when someone has no intentions of participating in an activity. Ntoumanis (2001) has recognized three different types of extrinsic motivation in adolescents. These three include external (participate to attain external incentives such as rewards or punishment), introjected

(participate to gain social recognition or avoid internal pressures and feelings of guilt), and identified regulation (participate to obtain benefits they deem important such as friendship, good health). There is a hypothesis that a high level of self-determined form of motivation is linked to a low level of non-self-determined form of motivation (Pan et al., 2011).

Achievement Goal Theory, posited by Nicholls (in 1989 and 1992 studies), claims athletes' motivation is molded by goals and behaviors considered by the individual to be the most successful. It also highlights that success in sports is not determined solely by the individual pursuing mastery, but is influenced by environmental factors. While the individual's motivation is one of the most important factors, secondary is the coach's influence and leadership behaviors, such as their instructiveness, supportiveness, and rewarding behavior (Chelladurai, 1990). These two factors interplay in determining the athlete's behavior (Roberts, 2001). More formally, Duda and Balaguer (1999) posited the Integrated Model of Antecedents and Consequences of Coach Leadership, which claims that individual or team motivational patterns are determined by the interaction of athlete's personalities, goal orientations, self-perceived ability (deemed 'individual differences') and the individual's perception of the motivational climate of his/her team.

Due to many intersecting factors, such as persistent orientations, predominant motivation, and perceptions of athlete's motivation, there is an ample amount of coaching 'types.' In concordance with this, it is possible to presume that different coaches have different types of motivational structure (Deci and Ryan, 1987). This can be influenced by intrinsic or extrinsic factors, and in turn, influences athletes' intrinsic motivation and self esteem (Vallerand & Pelletier, 1985). It would be logical to hypothesize that a

coach's motivation could have a great impact on their leadership behavior, which in turn, affects the athletes' goal choices and the team's motivational pattern, which then influences the cohesiveness of a team, the quality of athletes' performance and achievements, and the persistence of the athletes within the sport.

Though research in academics is an entirely different area of study, it is easily applicable to sports, as teachers are in a similar respective authoritative position to coaches. A study by Deci et al (1981) showed two dominant teaching styles in the classroom: controlling and autonomy oriented. Students whose teachers veered towards the more autonomy oriented teaching style tended to score higher on intrinsic motivation than those whose teachers were more controlling. In a controlling style, teachers are essentially stripping students of their self-determination, thus lowering their intrinsic motivation. More autonomy-oriented teachers encourage students and facilitate them to take responsibility for their behavior and learning, thus increasing their intrinsic motivation.

How these external factors such as reward, competition, feedback and choice work to enhance or undermine intrinsic motivation is known as Cognitive Evaluation Theory (Deci & Ryan, 1985; Ryan, 1982; Frederick & Ryan, 1995). According to this theory, people can interpret their performance either informationally or in a controlling manner (Ryan, Vallerand, & Deci, 1984). Highly controlling events have a rigid structure and many rules, which would serve to limit participants' autonomy and foster a sense of extrinsic control, thus resulting in lowered levels of intrinsic motivation. Any factors can be interpreted as being controlling/externally motivating, such as competitive environments and rewards. Interpreting performance in an informational manner results

in either a positive or negative perspective, with positive interpretation equating to competence, and negative to incompetence.

Perceptions of motivational climate vary among athletes, even when on the same team. This is due to many factors, such as coaches' individual feedback (Cumming et al., 2007; Duda, 2001). Horn (1985) proposed that frequency and amount aren't the most critical aspects about feedback, but rather time, place and content. Thus, what type of coaching responses athletes prefer or need are important facets to examine, as the congruence between them are critical to the athlete's success, satisfaction, and well-being (Stein et al, 2012). Stein's study showed that ego-involving motivational climate increased as perceived/preferred punishment and nonreinforcement for good performances increased. Ego-involving motivational climate proved to be higher when athletes were not receiving enough positive and informational feedback, or any feedback, from their coach. "An ego-involving motivational climate has been linked to higher levels of athletes' anxiety, worry, tension, perceived performance pressure, and maladaptive coping" (Stein et al, 2012).

Similarly, Black and Weiss (1992) determined that young athletes had more intrinsic motivation with coaches who consistently delivered informational advice after good performances, and encouragement and support (as well as informational advice) following bad performances. In Ryan's 1985 study, teachers who gave positive, informationally based feedback increased their students' perceptions of ability and control. Horn (1987) found that informational feedback about errors in performance increased students' intrinsic motivation, as the student had something to work towards, that they were capable of attaining.

As stated earlier, Achievement Goal Theory by Nicholls (1989 and 1992) claims that coaches' influence and leadership behaviors, such as their instructiveness, supportiveness, and rewarding behavior interplay with individuals' motivational structures in determining athletes' behaviors (Roberts, 2001). Motivation to achieve depends on task-oriented and ego-oriented goals. Coaches who influence an ego-oriented structure tend to be autocratic, controlling leaders who emphasize outcome over effort and star players over others. Democratic coaches are more instructive, supportive, and focus on process over outcome (Green-Demers, 1998). Bucik & Baric (2009) accredit the democratic style with being more appropriate for the development of 'desirable motivational patterns' in athletes, for they will foster stronger commitment and higher achievements, as well as healthier attitudes (Reimer & Toon, 2001; Stornes & Bru, 2002). Based on several scales, this study attempted to determine if coaching feedback relates at all to individuals' tendency to systemize or empathize, or placement on the Autism Spectrum. The type of coaching responses athletes receive are important facets to examine, as the congruence between them are critical to the athlete's success, satisfaction, and well-being (Horn, 1985; Stein et al, 2012). Stein's study on perceived and preferred coaching responses showed that athletes were more ego-oriented if their coaches punished more or didn't reinforce them enough. This study investigated if athletes' intrinsic motivation is determined by placement on SQ, AQ and EQ Scales, and whether athletes with HFA demonstrate greater levels of intrinsic motivation than those who score lower on the Systemizing and Autism Questionnaires. In addition, the study sought to uncover whether those prone to systematizing (and perhaps higher on the AQ) tend to be more intrinsically motivated than those who are more prone to empathizing, as

social rewards may not be as important to them. The study may provide insight into how athletes may impact feedback from their coaches based on where they are on the SQ, AQ and EQ Scales.

## **VI. Autism Spectrum Disorders, motivation, and the current study**

Baron-Cohen and Wheelwright were pioneers in constructing scales to test for sex differences in emotionality and cognitive processing among males and females, as well as characteristics of those with ASDs. They were the first to statistically demonstrate relationships between empathy and one's placement on the Autism Spectrum, as well as determining relationships between systemizing and autistic traits. Their 2006 study tested a group of students (723 males, 1038 females) in comparison to a group of adults diagnosed with ASD (69 males, 56 females). In the study, the AQ score was successfully predicted from EQ and SQ-R scores. The ASD group scored higher than sex-matched controls on the SQ-R, and showed no sex differences on any of the 3 measures. The majority of adults with ASD were Extreme Type S, compared to 5% of typical males and 0.9% of typical females. The EQ had a weak negative correlation with the SQ-R, which suggested that empathizing is largely but not completely independent of systemizing. The weak but significant negative correlation may indicate a trade-off between them.

In the typical group, there was a strong negative correlation between the AQ and EQ, and a moderate positive correlation between the AQ and SQ-R. The negative correlation between the EQ and SQ-R was significant, but relatively weak, suggesting that there is a feeble trade-off between the two. The negative correlation between EQ and SQ-R in the ASD group was much greater, suggesting a stronger trade-off between empathizing and systemizing in this group. The data supported the E-S Theory: 45% of

typical females had a Type E brain, the 50% of typical males had a Type S brain, and 62% of adults with an ASD had an Extreme Type S brain. Absence of the typical sex difference in the ASD group indicates hyper-masculinization of both males and females with ASD.

The current study is based on Baron-Cohen and Wheelwright's 2006 developments. Subjects' levels of empathy, systemizing, locations on the autism spectrum, and actual feedback from their coaches were tested using the scales developed in the aforementioned study (in addition to others). Athletes with HFA were predicted to be primarily classified as having Extreme S personality, whereas neurotypical athletes would vary: men were expected to primarily be S types, and women were anticipated to primarily be E types, but overlap was assumed. It was also assumed that it would be difficult to recruit a substantial population of athletes with HFA, as individuals with ASD are not only communicatively, socially, and behaviorally impaired, they also often exhibit atypical patterns of movement skills development (Green et al., 2009; Ozonoff et al., 2008). People in general do not engage in enough physical exercise to enhance well-being, but those with ASD are even worse off. Physical exercise would be especially helpful to children with ASD not solely for the health benefits, but for motor movement and improvement. Perhaps this study will help people figure out ways to incorporate children with ASD into physical education activities.

### ***Method***

#### **Participants**

The participants in the current study were 25 individuals over the age of 18. Out of these 25 participants, 12 were female and 13 were male. The mean age of the participants was 20.4 years and the age range was 18 to 23. Participants were recruited through Facebook, word of mouth, email, and phone. All were still in college, and all had completed at least one season of cross country or long distance track while in college. Participants ran for such teams as Claremont-Mudd-Scripps, Pomona-Pitzer, Santa Monica College, Santa Clara College, Colby College, Chapman University, University of California Santa Barbara, and University of California Santa Cruz.

All participants were fully informed of the goals in the experiment, and were treated with confidentiality and according to the “Ethical Principles of Psychologists and Code of Conduct” (American Psychological Association, 1992). Consent forms were included at the beginning of the online survey. By clicking ‘I agree’ in response to the question on the bottom of the informed consent form, the participant was agreeing to participate in the study as well as acknowledging the potential risks involved in participation in the study. There was a high attrition rate, most likely due to the length of the study as well as lack of monetary or material incentive. 18 participants were excluded from the dataset due to a large number of missing responses on the questionnaire, primarily because they dropped out in the middle of the study.

#### **Materials**

5 different scales were used to assess the participants, in addition to asking participants to provide answers to demographic questions.

**Demographic Information:** Demographic information was collected from each participant. This included questions about the participant's age, diagnosis of an Autism Spectrum Disorder, gender and years as a runner.

Table 1

*Demographic Questions*

<b>Category</b>	<b>Potential Answers</b>
Age	18; 19; 20; 21; 22; 23
Diagnosis	No diagnosis; Autism Spectrum Disorder
Gender	Male; Female; I don't choose to identify with either M or F
Years Running	1-2 years; 3-5 years; over 5 years

Scales:

**Empathy Quotient (EQ):** (see Appendix A) a sixty item list that measures one's affect as well as one's ability to interpret emotions using a 4 point Likert-type scale. S. Baron-Cohen, the inventors of the scale, define empathy as "the drive or ability to attribute mental states to another person/animal, and entails an appropriate affective response in the observer to the other person's mental state" (2004). The test contains 40 items that test for empathy (in accordance with this definition) as well as 20 items that are filler, or unrelated to empathy. On each question a person can score a maximum of 2 and minimum of 0. Two points are awarded to each answer that is strongly empathetic, and one point is given to answers that are mildly empathetic. The maximum score on the EQ is 80 points, and the minimum is zero.

Table 2

*Sample questions from the EQ.*

Scored questions: "I find it difficult to explain to others things that I understand easily, when they don't understand it the first time."

"I really enjoy caring for people."

Filler questions: "I dream most nights."

"I am at my best first thing in the morning."

**Systemizing Quotient Revised (SQ-R):** (see Appendix B) a 75 item list that measures one's drive to analyze or construct a system (2003). A 'system' is defined as anything that follows rules or has a structure. Like the EQ, participants indicate how strongly they agree or disagree with the statement on a Likert-type scale. One point is awarded for each answer that is mildly related to systematizing, and two points are awarded for every answer that strongly relates to systematizing. Participants can score a maximum of 150 on the test, and a minimum of 0.

Table 3

*Sample questions from the SQ.*

**Example**

"I am fascinated by how machines work."

"I find it very easy to use train timetables, even if this involves several connections."

"I like music or book shops because they are clearly organised."

*Note.* Participants rated the extent to which they agreed with each statement on a 4-point scale from 1 ("definitely disagree") to 4 ("definitely agree").

**Autism Spectrum Quotient:** (see Appendix C) a fifty item questionnaire designed by S. Baron-Cohen and colleagues in 2001. Its aim is to measure the degree to which adults of normal intelligence have traits associated with autism spectrum disorders. It is in the same format (4-point Likert-type scale) as the SQ and EQ: next to each item the participant must choose one of four answers: 'strongly disagree,' 'slightly disagree,' 'slightly agree,' and 'strongly agree.' Each answer is quantified by a score of 0 or 1. The scores vary upon the questions: responses count for one point if the participant reported moderate or severe autistic-like behaviors (see Index for scoring). The AQ assesses five different areas: social skill, attention switching, attention to detail, communication and

imagination. These items were chosen in accordance with the ‘triad’ of autistic symptoms: 1. qualitative impairment in social interaction and 2. communication, as well as 3. restricted, repetitive and stereotyped patterns of behavior (APA, 1994).

Additionally, subscales were selected from exhibited areas of cognitive abnormality in individuals with autism.

#### Table 4

*Sample questions from the AQ.*

<b>Subscale</b>	<b>Example</b>
Social Skill	“I find it hard to make new friends.”
Attention switching	“I prefer to do things the same way over and over again.”
Attention to detail	“I am fascinated by dates.”
Communication	“I am good at social chitchat.”
Imagination	“I find it difficult to imagine what it would be like to be someone else.”

*Note.* Participants rated the extent to which they agreed with each statement on a 4-point scale from 1 (“definitely disagree”) to 4 (“definitely agree”).

**Coaching Feedback Questionnaire (CFQ)** (see Appendix D) by Amarose and Horn, 2000 tests for typical coach feedback to performance, as well as preferred coach feedback. In this study, however, only the former was included. Whereas the CFQ is typically a thirty two item scale, solely the 16 items pertaining to typical coaching feedback were selected. The scale is comprised of 8 subcategories: reinforcement alone, non-reinforcement, reinforcement plus technical comments, ignoring errors, corrective instruction after errors, punishment after errors, corrective instruction with punishment after errors, and encouragement after errors. Participants indicate answers to typical coaching feedback on a scale of 1-5, 1 being ‘Not Typical At All’; 2 being ‘Rarely Occurs’; 3 being ‘Sometimes Occurs’; 4 being ‘Often Occurs’; and 5 being ‘Very Typical.’

Table 5

*Sample questions from the CFQ.*

<b>Subscale</b>	<b>Example</b>
reinforcement alone	“Good play!”
non-reinforcement	Coach ignores your good performance.
reinforcement plus technical comments	“Way to go! You really extended your elbow that time!”
ignoring errors	Coach ignores your error or poor performance.
corrective instruction after errors	“You dropped your elbow. Next time keep it up.”
corrective instruction with punishment after errors	“How many times have I told you to extend your elbow!”
encouragement after errors	“That’s O.K.! Keep working at it!”

**Intrinsic Motivation Inventory (IMI)** (see Appendix E) by Baric, et al., 2002; McAuley, Duncan & Tammem 1989 is composed of 18 items, utilizing a 7-point Likert-type scale. The test typically assesses six subcategories: participants’ perceived confidence, choice, felt pressure and tension, enjoyment/interest, effort, and value/usefulness. The IMI was adapted for running for this study, and only utilized four of the six subcategories: interest/enjoyment, perceived competence/confidence, perceived choice/effort, and tension/pressure. Responses are scored as followed: 1, Never; 2, Rarely; 3, Occasionally; 4, Sometimes; 5, Frequently; 6, Usually; 7, All The Time. Responses were reverse scored for questions phrased in the negative.

Table 6

*Sample questions from the IMI.*

<b>Subscale</b>	<b>Example</b>
interest/enjoyment	“While running, I think about how much I enjoy it.”
perceived competence/confidence	“I am pretty skilled at running.”

perceived choice/effort  
tension

“I don’t try very hard at running.”  
“I feel tense while running.”

### **Procedure**

Following attainment of informed consent and assent, the participants completed an online survey with four demographic questions concerning age, gender, diagnosis and years running. The rest of the survey was comprised of the Empathy Quotient, Systemizing Quotient Revised, Autism Quotient, Coaching Feedback Questionnaire, and Intrinsic Motivation Inventory. Recruitment varied based on the school and connections to team members. Due to friendships with many of the cross country/long distance track athletes on the Claremont-Mudd-Scripps team, most of the team was contacted via phone calls and Facebook messages. An email explaining the study and providing the link to the survey was sent to the Claremont-Mudd-Scripps team, the Pitzer-Pomona team, the SMC team, and the Colby team. Other teams were contacted via facebook, through friends and captains. All potential participants were informed of the details of the study- the hypotheses, various tests and their significance, and current research, as well as their right to discontinue the survey for any reason. All participants signed a form that acknowledged that they have been informed and voluntarily consent online via SurveyMonkey, the site in which the survey was posted.

The study took place at the participants’ disclosure. Considering the study was completed online, it is expected that the majority of individuals completed the survey at college (in dorm rooms or computer labs), or at home (their apartments, houses, etc.).

To be eligible to be counted in the data, participants were required to answer most, if not every question of every test. They were granted as much time as they needed to finish

all questions and work through each test thoroughly. Monetary, material or other compensation was not used as an incentive for participating in the study.

### **Design**

In the current study, it is predicted that athletes with HFA will demonstrate greater levels of intrinsic motivation than those who score lower on the Systemizing and Autism Questionnaires. In addition, it is predicted that those who are more prone to systematizing (and perhaps higher on the AQ) will be more intrinsically motivated than those who are more prone to empathizing, as social rewards may not be as important to them. Overall, the study seeks to discern how individuals influence feedback from their coaches, as well as how people are differently intrinsically oriented.

The study is a correlation between the independent variables SQ, EQ, and AQ, and linear regression analyses on the first dependent variable, IMI and SQ, EQ, and AQ, and an independent samples t-test between CFQ, the second dependent variable, and SQ, EQ and AQ and gender.

### **Results**

A [2-tailed] Pearson correlation was carried out on the Systematizing Questionnaire, Empathy Questionnaire, Autism Questionnaire, and the Intrinsic Motivation Inventory. There was a marginally significant positive relationship between the SQR Total (M=54.96, SD=13.43342) and IMI perceived choice/effort subscale (M=11.52, SD=1.61038),  $r(24)=.348$ ,  $p=.089$  indicating that the higher one's place on the SQR, the more likely the individual is to perceive more of a choice and put forth more of

an effort into running. There was a significant positive linear relationship between SQR Total (M=54.96, SD=13.43342) and IMI tension (M=26.12, SD=4.33321),  $r(24)=.447$ ,  $p=.025$  implying that the higher one's placement on the SQR, the higher the individual's levels of tension and anxiety. There was a marginally significant negative relationship between the AQ Total (M=16.88, SD=6.19355) and SQR Total (M=54.96, SD=13.43342),  $r(24)= -.346$ ,  $p=.091$  suggesting that the higher one's placement on the SQR, the lower one's placement on the AQ, and vice versa. This is an abnormal finding, as in most studies, the two are strongly positively correlated. There was a significant positive linear relationship between SQR Total (M=54.96, SD=13.43342) and EQ Total (M=39.24, SD=11.53719),  $r(24)=.476$ ,  $p=.016$ , indicating that the more prone the individual was to systematizing, the more prone they were to empathizing, and vice versa. This is also an abnormal finding, as in most studies the two are negatively correlated. There was a significant negative linear relationship between EQ Total (M=39.24, SD=11.53719) and AQ Total (M=16.88, SD=6.19355),  $r(24)= -.551$ ,  $p=.004$ , which is expected, as the more empathetic the person, the lower they demonstrate autistic traits, and vice versa. The connection between systematizing and perceived choice as well as tension were understandable, considering that people who are prone to systematizing are more internally motivated than externally, putting more pressure on themselves. The negative relationship between AQ and SQ, as well as the positive relationship between SQ and EQ, were both irregular and counterintuitive results. EQ and AQ were significantly negatively correlated, as predicted from past studies.

A [2-tailed] Spearman's rho correlation was carried out on the Systematizing Questionnaire, Empathy Questionnaire, Autism Questionnaire, and the Intrinsic

Motivation Inventory. As seen in the Pearson correlation prior, there was a positive linear relationship significant at the  $\alpha=.01$  level between SQR Total(M=54.96, SD=13.43342) and the EQ Total (M=39.24, SD=11.53719),  $r(24)=.508$ ,  $p=.01$ . As predicted, there was a negative linear relationship significant at the  $\alpha=.01$  level between AQ Total (M=16.88, SD=6.19355) and the EQ Total (M=39.24, SD=11.53719),  $r(24)= -.519$ ,  $p=.008$ . The results of the Spearman’s rho correlation confirmed the validity of the Pearson correlation.

A linear regression analysis was conducted on IMI interest/enjoyment as a factor of SQ, EQ and AQ. When scores on the IMI interest/enjoyment were predicted it was found that there were no significant predictors. All were marginally significant: SQ( $\beta=.079$ , n.s.), EQ( $\beta=.056$ , n.s.), and AQ( $\beta= -.098$ , n.s.). The overall model fit was  $R^2=.119$ . Intrinsic interest/enjoyment could not be determined from scores on the AQ, SQ, or EQ: there were no significant relationships.

Figure 1: Data spreadsheet

<b>Group Statistics</b>					
	Nominal	N	Mean	Std. Deviation	Std. Error Mean
IMIIntrestenjoyment	1.00	12	25.0000	5.22233	1.50756
	0.00	13	25.0000	5.71548	1.58519
IMIperceivedcompetence	1.00	12	27.1667	2.88675	0.83333
	0.00	13	26.9231	4.75152	1.31783
IMIperceivedchoicereffort	1.00	12	10.9167	1.92865	0.55675
	0.00	13	12.0769	1.03775	0.28782
IMItension	1.00	12	25.9167	5.55073	1.60236
	0.00	13	26.3077	3.03822	0.84265

SQRTotal	1.00	12	50.9167	14.92075	4.30725
	0.00	13	58.6923	11.19810	3.10579
EQTotal	1.00	12	43.0000	12.76358	3.68453
	0.00	13	35.7692	9.47060	2.62667
AQTotal	1.00	12	17.3333	6.40076	1.84774
	0.00	13	16.4615	6.22649	1.72692
CFQreinforcementalone	1.00	12	5.9167	1.83196	0.52884
	0.00	13	5.9231	2.01914	0.56001
CFQnonreinforcement	1.00	12	4.9167	2.31432	0.66809
	0.00	13	4.6923	2.13638	0.59252
CFQreinforcementtechcomments	1.00	12	4.8333	1.94625	0.56183
	0.00	13	4.3846	1.89466	0.52548
CFQignoringerrors	1.00	12	5.0833	2.19331	0.63315
	0.00	13	3.6923	1.79743	0.49852
CFQcorrectiveinstructionaftererrors	1.00	12	4.6667	1.92275	0.55505
	0.00	13	4.3846	1.55662	0.43173
CFQpunishmentaftererrors	1.00	12	2.1667	0.38925	0.11237
	0.00	13	3.9231	2.17798	0.60406
CFQcorrectiveinstructionwithpunishmentaftererrors	1.00	12	2.8333	1.74946	0.50503
	0.00	13	3.1538	1.90815	0.52922
CFQencouragementaftererrors	1.00	12	6.0000	1.20605	0.34816
	0.00	13	4.2308	2.12736	0.59002

Figure 1 shows all the means, standard deviations, and categories of independent and dependent variables used in every test. This particular table was selected from the Independent Samples T-test, which investigated gender differences on all scales.

A linear regression analysis was conducted on IMI perceived competence as a factor of SQ, EQ and AQ. When scores on the IMI perceived competence were predicted it was found that there were two significant predictors: SQ( $\beta=.027$ ,  $p<.05$ ), and AQ( $\beta=.004$ ,  $p<.01$ ). EQ( $\beta=.074$ , n.s.) was marginally significant. The overall model fit was  $R^2=.074$ . One's intrinsic perceived competence was able to be determined by one's score on both the SQ and AQ, while one's score on the EQ was not as reliable.

A linear regression analysis was conducted on IMI perceived choice/effort as a factor of SQ, EQ and AQ. When scores on the IMI perceived choice/effort were predicted it was found that all three scales were significant predictors: SQ( $\beta=.05$ ,  $p<.05$ ), and AQ( $\beta=.023$ ,  $p<.05$ ). EQ( $\beta= -.011$ ,  $p<.05$ ) was marginally significant. The overall model fit was  $R^2=.138$ . Individuals' perceived choice/effort could reliably be determined from one's scores on the AQ, SQ and EQ.

A linear regression analysis was conducted on IMI tension as a factor of SQ, EQ and AQ. When scores on the IMI tension were predicted it was found that two scales were marginally significant predictors: EQ( $\beta= -.063$ , n.s.), and AQ( $\beta=.061$ , n.s.). SQ( $\beta=.179$ , n.s.) was not a reliable predictor. The overall model fit was  $R^2=.239$ .

Figure 2: Relationship between SQ and IMI tension

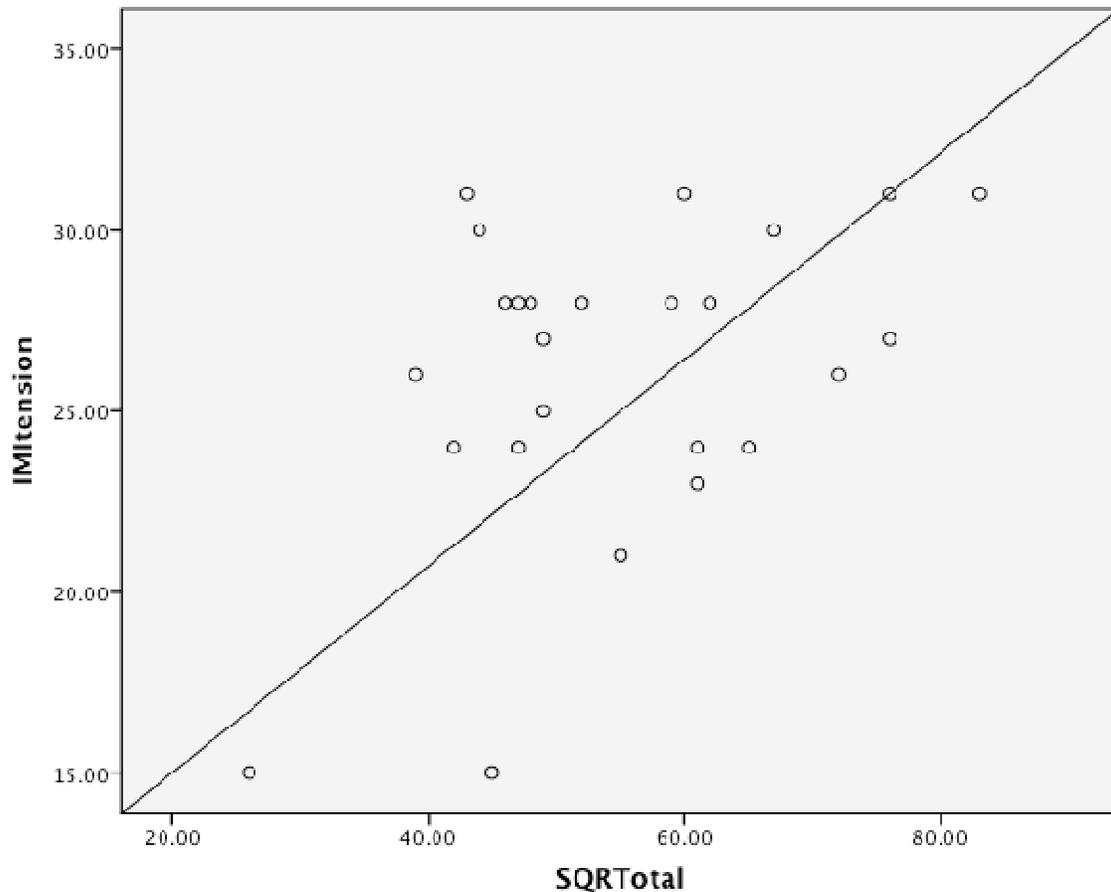


Figure 2 illustrates the significant positive linear correlation between SQR Total and IMI tension

A Pearson's correlation was carried out on the relationship between CFQ and SQR, EQ and AQ. SQR Total (M=54.96, SD=13.43342) and CFQ non-reinforcement (M=4.8, SD=2.17945),  $r(24) = -.483$ ,  $p = .015$  had a significant negative relationship, indicating that the higher one's placement on the SQR, the less they reported coaches giving them no feedback. SQR Total (M=54.96, SD=13.43342) and CFQ ignoring errors (M=4.36, SD=2.07926),  $r(24) = -.505$ ,  $p = .010$  had a significant negative correlation as well, meaning that the higher one's placement on the SQR, the less they reported coaches ignoring their errors. EQ Total (M=39.24, SD=11.53719) and CFQ reinforcement alone (M=5.92, SD=1.89121),  $r(24) = .390$ ,  $p = .054$ , had a marginally significant positive

relationship, indicating that the higher one's placement on the EQ, the more they report being reinforced by coaches (no punishments or technical advice included in the feedback). EQ Total ( $M=39.24$ ,  $SD=11.53719$ ) also had a marginally significant positive relationship with CFQ non-reinforcement ( $M=4.8$ ,  $SD=2.17945$ ),  $r(24) = -.368$ ,  $p=.071$ , implying that the higher one's place on the EQ, the more they report not being reinforced by coaches. EQ Total ( $M=39.24$ ,  $SD=11.53719$ ) had a marginally significant negative relationship with CFQ punishment after errors ( $M=3.08$ ,  $SD=1.80093$ ),  $r(24) = -.354$ ,  $p=.083$ , indicating that the higher one's placement on the EQ, the less they report being punished by their coaches after committing an error. SQR Total ( $M=54.96$ ,  $SD=13.43342$ ) and CFQ corrective instruction with punishment after errors ( $M=3.00$ ,  $SD=1.80278$ ),  $r(24) = -.375$ ,  $p=.065$  had a marginally significant negative relationship, indicating that the higher one's placement on the SQR, the less they reported receiving corrective instruction with punishment after errors from coaches. Athletes that scored high on the SQR reported being ignored less by coaches in general and when they committed errors, indicating that coaches are more attentive to individuals who are prone to systematizing, or, perhaps, memories of individuals who are more prone to systematizing vary from those of individuals who are more prone to empathizing. Individuals that scored higher on the EQ reported that when being reinforced they do not typically receive punishment or technical correction, but they also reported not being reinforced by coaches as often as others did. Additionally, the higher one's placement on the EQ, the less they report being punished by their coaches after committing an error. Coaches appear to give less feedback over all to those who are more prone to empathizing, or this could, again, have more to do with the memories of individuals who

are more prone to empathizing. The higher one's placement on the SQR, the less they reported receiving corrective instruction with punishment after errors from coaches.

A Spearman's rho correlation was carried out on the relationship between CFQ and SQR, EQ and AQ. SQR Total (M=54.96, SD=13.43342) and CFQ non-reinforcement (M=4.8, SD=2.17945),  $r(24) = -.397$ ,  $p = .05$ , had a significant negative relationship. EQ Total (M=39.24, SD=11.53719) and CFQ reinforcement alone (M=5.92, SD=1.89121),  $r(24) = .380$ ,  $p = .061$  had a marginally significant positive relationship. EQ Total (M=39.24, SD=11.53719) and CFQ non-reinforcement (M=4.8, SD=2.17945),  $r(24) = -.357$ ,  $p = .08$ , had a marginally significant negative relationship. SQR Total (M=54.96, SD=13.43342) and CFQ ignoring errors (M=4.36, SD=2.07926),  $r(24) = -.411$ ,  $p = .042$ , had a significant positive correlation. SQR Total (M=54.96, SD=13.43342) and CFQ corrective instruction with punishment after errors (M=3.00, SD=1.80278),  $r(24) = -.420$ ,  $p = .037$  had a significant negative correlation. The Spearman's rho confirmed the data from the Pearson correlation to be valid.

An independent samples t-test was carried out on CFQ, SQ, EQ, AQ and IMI as a factor of gender. There was a marginally significant negative mean difference between males and females on IMI perceived choice/effort,  $t(24) = -1.894$ ,  $p = .071$  (Equal variances assumed), indicating that males (M=12.0769, SD=1.03775) reported having more of a choice and putting in more effort to running than did females (M=10.9167, SD=1.92865). There was a marginally significant positive mean difference between males and females pertaining to CFQ ignoring errors,  $t(24) = 1.740$ ,  $p = .095$  (Equal variances assumed) indicating that females (M=5.0833, SD=2.19331) reported their coaches to ignore their errors more often than males (M=3.6923, SD=1.79743) did. There

was a significant negative mean difference between males and females in responses to CFQ punishment after errors,  $t(24) = -2.749$ ,  $p = .011$  (Equal variances assumed), indicating that males ( $M = 3.9231$ ,  $SD = 2.17798$ ) reported receiving more punishment from their coaches after committing errors than did females ( $M = 2.1667$ ,  $SD = .38925$ ). Males reported more of a choice and putting in more effort to running than did females, and that they received more punishment than females after they committed errors, but they reported that their coaches ignored their errors less often than females. Interestingly, there was no relationship between gender and the SQR, EQ or AQ, which is atypical compared to past studies.

### ***Discussion***

The current study tested how one's gender and placement on the EQ, SQ, and on the Autism Questionnaire affect intrinsic motivation in athletics. There were two primary hypotheses the current study sought to investigate. The first prediction was that athletes with HFA would demonstrate greater levels of intrinsic motivation than those who score lower on the Systemizing and Autism Questionnaires, based on the effects Autism has on social cognitive processing (social rewards processing and motivation) and processing of local/global aspects of stimuli (high processing of local, systematic aspects, low processing of global aspects, resulting in a rigid scope). In addition, it was predicted that those who are more prone to systematizing (and perhaps higher on the AQ) would be more intrinsically motivated than those who are more prone to empathizing, as social rewards may not be as important to them.

Considering no athletes reported having a formal diagnosis of HFA, the first hypothesis was unable to be proven or disproven. When broadened to having a high score

on the AQ, there was still no demonstration of greater levels of intrinsic motivation in comparison to those who scored lower on the Systemizing and Autism Questionnaires. The second hypothesis predicted that those who were more prone to systematizing (and perhaps higher on the AQ) would be more intrinsically motivated than those who are more prone to empathizing, which they were in both the IMI tension and IMI perceived choice and effort categories. These results indicated that there is a strong connection between internal motivation and systematizing. It would make sense for systematizers to put more pressure on themselves as well as be more invested in the activity than those who systemize less and who are more extrinsically motivated.

Baron-Cohen and Wheelwright's 2006 study classified those on the Autism Spectrum as having Extreme S personality, and males being Systematizers, females Empathizers. In line with this study, it was predicted that athletes with HFA would primarily be classified as having Extreme S personality, whereas neurotypical athletes would vary: men were expected to primarily be S types, and women were anticipated to primarily be E types, but overlap was assumed. Results were contrary to everything that had been predicted. Since athletes with HFA were unable to be recruited, a high score on the AQ was substituted into the hypothesis. There were no scores high enough to warrant an Extreme S personality. In addition, SQR and AQ were demonstrated to have a negative relationship, an abnormal finding. In most studies, including Baron-Cohen and Wheelwright's 2006 study, the two are strongly positively correlated. In fact, the tendency to systematize is a subsection of the main criteria of diagnosing ASDs. Another peculiar finding was that EQ and SQ were found to be positively correlated, whereas in most studies the two are negatively correlated. Perhaps these two abnormalities in score

relationships could be explained by the lack of validity of online surveys, or perhaps the small population with strong character differences. People may have taken the study survey together, as noted by some unusual patterns in response (four participants next to each other had the same answers in a row for 5 completely different questions). Taking the survey in the presence of other people would definitely impact individuals' responses, most likely to portray themselves better: higher systematizers, higher empathizers, lower on the AQ. The significant negative relationship between EQ Total and AQ Total was a more expected finding, indicating the more empathetic the person, the lower they demonstrate autistic traits, and vice versa.

There were no past studies to reference when looking into SQ-R, AQ and EQ relationships with CFQ. Athletes that scored high on the SQ-R reported being ignored less by coaches in general and when they committed errors, which may indicate a certain way systematizers remember things. Another explanation could be the manner in which they may act towards coaches may elicit more responses; they may be easier to respond (for unknown reasons) to than those who are more prone to empathizing. Individuals that scored higher on the EQ reported being reinforced without punishment or technical corrections, but they also reported not being reinforced by coaches. Additionally, the higher one's placement on the EQ, the less they reported being punished by their coaches after committing an error. Those who scored high on the EQ may have more emotional memories than those who are more prone to systematizing. It is also an option that their coaches may give them conflicting feedback, though. Those who scored high on the SQR, reported receiving less corrective instruction with punishment after errors from coaches, which may indicate that they are more inclined to remember technical

instruction than emotional feedback. In terms of gender differences, males reported more of a choice and putting in more effort to running than did females, which may have something to do with physical prowess valued as a part of an evolutionary need to be the 'hunter' in society. Males also reported received more punishment than females after they committed errors perhaps due to higher standards for male athletic achievement in society. The same explanation may apply to males reporting that their coaches ignored their errors less often than females.

This study provided insight as to how individuals' scores on the SQ-R, EQ and AQ affect intrinsic motivation, in addition to information on sex differences with coaching feedback. However, the main goals of the study were not achieved in regards to the HFA population the study had hoped to recruit. Thus, a way to further this study would be to recruit athletes with HFA and investigate how their diagnosis affects their levels of intrinsic motivation and the feedback reported from their coaches. Another step to take would be to find out what feedback athletes would prefer to hear from their coaches, and see where their preferred feedback relates to their placement on the Autism Spectrum. The importance of these furthering this study would be to develop effective support systems or teaching styles depending on different abilities. People in general do not engage in enough physical exercise to enhance well-being, but those with ASD are even worse off. Involving children with ASD in physical education classes or clinics would benefit them not only in health, but for motor movement and improvement. Hopefully this study and future studies will help people figure out ways to incorporate children with ASD into physical education activities.

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## *Appendix*

Contents:

- A. Empathy Quotient
- B. Systemizing Quotient
- C. Autism Quotient
- D. CFQ (Coaching Feedback Questionnaire)
- E. Intrinsic Motivation Inventory
- F. Informed Consent
- G. Debriefing
- H. Facebook and email research advertisement

### **A. EQ**

How to Fill Out the Questionnaire

Below is a list of statements. Please read each statement carefully and rate how strongly you agree or disagree with it by circling your answer. There are no right or wrong answers, or trick questions.

**IN ORDER FOR THE SCALE TO BE VALID, YOU MUST ANSWER EVERY QUESTION.**

Examples

E1. I would be very upset if I couldn't listen to music strongly slightly slightly strongly every day. agree agree disagree disagree

E2. I prefer to speak to my friends on the phone rather strongly slightly slightly strongly than write letters to them. agree agree disagree disagree

E3. I have no desire to travel to different parts of the strongly slightly slightly strongly world. agree agree disagree disagree

- E4. I prefer to read than to dance. strongly slightly slightly strongly  
agree agree disagree disagree
1. I can easily tell if someone else wants to enter a conversation.
  2. I prefer animals to humans.
  3. I try to keep up with the current trends and fashions
  4. I find it difficult to explain to others things that I understand easily, when they don't understand it the first time.
  5. I dream most nights.
  6. I really enjoy caring for other people.
  7. I try to solve my own problems rather than discussing them with others.
  8. I find it hard to know what to do in a social situation
  9. I am at my best first thing in the morning. strongly slightly slightly strongly  
agree agree disagree disagree
  10. People often tell me that I went too far in driving my point home in a discussion.
  11. It doesn't bother me too much if I am late meeting a friend.
  12. Friendships and relationships are just too difficult, so I tend not to bother with them.
  13. I would never break a law, no matter how minor. strongly slightly slightly strongly  
agree agree disagree disagree
  14. I often find it difficult to judge if something is rude or polite.
  15. In a conversation, I tend to focus on my own thoughts rather than on what my listener might be thinking.
  16. I prefer practical jokes to verbal humor. strongly slightly slightly strongly  
agree agree disagree disagree
  17. I live life for today rather than the future. strongly slightly slightly strongly  
agree agree disagree disagree
  18. When I was a child, I enjoyed cutting up worms to see what would happen.
    1. I can pick up quickly if someone says one thing but means another.
    2. I tend to have very strong opinions about morality.
  21. It is hard for me to see why some things upset people so much.
  22. I find it easy to put myself in somebody else's shoes.
  23. I think that good manners are the most important strongly slightly slightly strongly  
thing a parent can teach their child. agree agree disagree disagree
  24. I like to do things on the spur of the moment. strongly slightly slightly strongly  
agree agree disagree disagree
  25. I am good at predicting how someone will feel.
  26. I am quick to spot when someone in a group is feeling awkward or uncomfortable.
  27. If I say something that someone else is offended strongly slightly slightly strongly  
by, I think that that's their problem, not mine.
  28. If anyone asked me if I liked their haircut, I would reply truthfully, even if I didn't like it.
  29. I can't always see why someone should have felt offended by a remark.
  30. People often tell me that I am very unpredictable. strongly slightly slightly strongly  
agree agree disagree disagree
  31. I enjoy being the center of attention at any social gathering
  32. Seeing people cry doesn't really upset me.
  33. I enjoy having discussions about politics.

34. I am very blunt, which some people take to be rudeness, even though this is unintentional.
35. I don't tend to find social situations confusing.
36. Other people tell me I am good at understanding how they are feeling and what they are thinking.
37. When I talk to people, I tend to talk about their experiences rather than my own.
38. It upsets me to see an animal in pain.
39. I am able to make decisions without being influenced by people's feelings.
40. I can't relax until I have done everything I had planned to do that day.
41. I can easily tell if someone else is interested or bored with what I am saying.
42. I get upset if I see people suffering on news programmes.
43. Friends usually talk to me about their problems as they say that I am very understanding.
44. I can sense if I am intruding, even if the other person doesn't tell me.
45. I often start new hobbies but quickly become strongly slightly slightly strongly bored with them and move on to something else. agree agree disagree disagree
46. People sometimes tell me that I have gone too far strongly slightly slightly strongly with teasing. agree agree disagree disagree
47. I would be too nervous to go on a big rollercoaster. strongly slightly slightly strongly agree agree disagree disagree
48. Other people, often say that I am insensitive, strongly slightly slightly strongly though I don't always see why. agree agree disagree disagree
49. If I see a stranger in a group, I think that it is up to strongly slightly slightly strongly them to make an effort to join in. agree agree disagree disagree
50. I usually stay emotionally detached when watching a film.
51. I like to be very organized in day-to-day life and strongly slightly slightly strongly often make lists of the chores I have to do. agree agree disagree disagree
52. I can tune into how someone else feels rapidly and strongly slightly slightly strongly intuitively. agree agree disagree disagree
53. I don't like to take risks. strongly slightly slightly strongly agree agree disagree disagree
54. I can easily work out what another person might strongly slightly slightly strongly want to talk about. agree agree disagree disagree
55. I can tell if someone is masking their true emotion. strongly slightly slightly strongly agree agree disagree disagree
56. Before making a decision I always weigh up the strongly slightly slightly strongly pros and cons. agree agree disagree disagree
57. I don't consciously work out the rules of social situations.
58. I am good at predicting what someone will do. strongly slightly slightly strongly agree agree disagree disagree
59. I tend to get emotionally involved with a friend's problems.
60. I can usually appreciate the other person's viewpoint, even if I don't agree with it.

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## B. SQ-R

Indicate for each question whether you strongly disagree, slightly disagree, slightly agree, or strongly agree

1. I find it very easy to use train timetables, even if this involves several connections.
2. I like music or book shops because they are clearly organised.
3. I would not enjoy organising events e.g. fundraising evenings, fetes, conferences.
4. When I read something, I always notice whether it is grammatically correct.
5. I find myself categorizing people into types (in my own mind).
6. I find it difficult to read and understand maps.
7. When I look at a mountain, I think about how precisely it was formed.
8. I am not interested in the details of exchange rates, interest rates, stocks and shares.
9. If I were buying a car, I would want to obtain specific information about its engine capacity.
10. I find it difficult to learn how to program video recorders.
11. When I like something I like to collect a lot of different examples of that type of object, so I can see how they differ from each other.
12. When I learn a language, I become intrigued by its grammatical rules.
13. I like to know how committees are structured in terms of who the different committee members represent or what their functions are.
14. If I had a collection (e.g. CDs, coins, stamps), it would be highly organized.
15. I find it difficult to understand instruction manuals for putting appliances together.
16. When I look at a building, I am curious about the precise way it was constructed.
17. I am not interested in understanding how wireless communication works (e.g. mobile phones).
18. When traveling by train, I often wonder exactly how the rail networks are coordinated.
19. I enjoy looking through catalogues of products to see the details of each product and how it compares to others.
20. Whenever I run out of something at home, I always add it to a shopping list.
21. I know, with reasonable accuracy, how much money has come in and gone out of my bank account this month.
22. When I was young I did not enjoy collecting sets of things e.g. stickers, football cards etc.
23. I am interested in my family tree and in understanding how everyone is related to each other in the family.
24. When I learn about historical events, I do not focus on exact dates.
25. I find it easy to grasp exactly how odds work in betting.
26. I do not enjoy games that involve a high degree of strategy (e.g. chess, Risk, Games Workshop).
27. When I learn about a new category I like to go into detail to understand the small differences between different members of that category.
28. I do not find it distressing if people who live with me upset my routines.
29. When I look at an animal, I like to know the precise species it belongs to.
30. I can remember large amounts of information about a topic that interests me e.g. flags of the world, airline logos.
31. At home, I do not carefully file all important documents e.g. guarantees, insurance policies

32. I am fascinated by how machines work.
33. When I look at a piece of furniture, I do not notice the details of how it was constructed.
34. I know very little about the different stages of the legislation process in my country.
35. I do not tend to watch science documentaries on television or read articles about science and nature.
36. If someone stops to ask me the way, I'd be able to give directions to any part of my home town.
37. When I look at a painting, I do not usually think about the technique involved in making it.
38. I prefer social interactions that are structured around a clear activity, e.g. a hobby.
39. I do not always check off receipts etc. against my bank statement.
40. I am not interested in how the government is organized into different ministries and departments.
41. I am interested in knowing the path a river takes from its source to the sea.
42. I have a large collection e.g. of books, CDs, videos etc.
43. If there was a problem with the electrical wiring in my home, I'd be able to fix it myself.
44. My clothes are not carefully organized into different types in my wardrobe.
45. I rarely read articles or webpages about new technology.
46. I can easily visualize how the motorways in my region link up.
47. When an election is being held, I am not interested in the results for each constituency.
48. I do not particularly enjoy learning about facts and figures in history.
49. I do not tend to remember people's birthdays (in terms of which day and month this falls).
50. When I am walking in the country, I am curious about how the various kinds of trees differ.
51. I find it difficult to understand information the bank sends me on different investment and saving systems.
52. If I were buying a camera, I would not look carefully into the quality of the lens.
53. If I were buying a computer, I would want to know exact details about its hard drive capacity and processor speed.
54. I do not read legal documents very carefully.
55. When I get to the checkout at a supermarket I pack different categories of goods into separate bags.
56. I do not follow any particular system when I'm cleaning at home.
57. I do not enjoy in-depth political discussions.
58. I am not very meticulous when I carry out D.I.Y or home improvements.
59. I would not enjoy planning a business from scratch to completion.
60. If I were buying a stereo, I would want to know about its precise technical features.
61. I tend to keep things that other people might throw away, in case they might be useful for something in the future.
62. I avoid situations which I cannot control.
63. I do not care to know the names of the plants I see.

64. When I hear the weather forecast, I am not very interested in the meteorological patterns.
  65. It does not bother me if things in the house are not in their proper place.
  66. In math, I am intrigued by the rules and patterns governing numbers.
  67. I find it difficult to learn my way around a new city.
  68. I could list my favorite 10 books, recalling titles and authors' names from memory.
  69. When I read the newspaper, I am drawn to tables of information, such as football league scores or stock market indices.
  70. When I'm in a plane, I do not think about the aerodynamics.
  71. I do not keep careful records of my household bills.
  72. When I have a lot of shopping to do, I like to plan which shops I am going to visit and in what order.
  73. When I cook, I do not think about exactly how different methods and ingredients contribute to the final product.
  74. When I listen to a piece of music, I always notice the way it's structured.
  75. I could generate a list of my favorite 10 songs from memory, including the title and the artist's name who performed each song.
- ©SW/SBC June 2005

### **C. The AQ**

#### How to Fill Out the Questionnaire

Below is a list of statements. Please read each statement carefully and rate how strongly you agree or disagree with it by circling your answer. There are no right or wrong answers, or trick questions.

1. I prefer to do things with others rather than on my own.
2. I prefer to do things the same way over and over again.
3. If I try to imagine something, I find it very easy to create a picture in my mind.
4. I frequently get so strongly absorbed in one thing that I lose sight of other things.
5. I often notice small sounds when others do not
6. I usually notice car number plates or similar strings of information.
7. Other people frequently tell me that what I've said is impolite, even though I think it is polite.
8. When I'm reading a story, I can easily imagine what the characters might look like.
9. I am fascinated by dates.
10. In a social group, I can easily keep track of several different people's conversations.
11. I find social situations easy.
12. I tend to notice details that others do not.
11. I would rather go to a library than a party.
12. I find making up stories easy.
15. I find myself drawn more strongly to people than to things.
16. I tend to have very strong interests, which I get upset about if I can't pursue.
13. I enjoy social chit-chat.
14. When I talk, it isn't always easy for others to get a word in edgeways.
15. I am fascinated by numbers.

20. When I'm reading a story, I find it difficult to work out the characters' intentions.
16. I don't particularly enjoy reading fiction.
17. I find it hard to make new friends.
18. I notice patterns in things all the time.
24. I would rather go to the theatre than a museum.
25. It does not upset me if my daily routine is disturbed.
26. I frequently find that I don't know how to keep a conversation going.
27. I find it easy to "read between the lines" when someone is talking to me.
28. I usually concentrate more on the whole picture, rather than the small details.
29. I am not very good at remembering phone numbers.
30. I don't usually notice small changes in a situation, or a person's appearance.
31. I know how to tell if someone listening to me is getting bored.
32. I find it easy to do more than one thing at once.
33. When I talk on the phone, I'm not sure when it's my turn to speak.
19. I enjoy doing things spontaneously.
35. I am often the last to understand the point of a joke.
36. I find it easy to work out what someone is thinking or feeling just by looking at their face.
20. If there is an interruption, I can switch back to what I was doing very quickly.
21. REPEATED EARLIER QUESTION ACCIDENTALLY
39. People often tell me that I keep going on and on about the same thing.
40. When I was young, I used to enjoy playing games involving pretending with other children.
41. I like to collect information about categories of things (e.g. types of car, types of bird, types of train, types of plant, etc.).
42. I find it difficult to imagine what it would be like to be someone else.
43. I like to plan any activities I participate in carefully.
22. I enjoy social occasions.
45. I find it difficult to work out people's intentions.
23. New situations make me anxious.
24. I enjoy meeting new people.
25. I am a good diplomat.
49. I am not very good at remembering people's date of birth.
50. I find it very easy to play games with children that involve pretending.
- MRC-SBC/SJW Feb 1998

#### **D. Coaching Feedback Questionnaire**

As you perhaps already know, coaches really differ from each other in the type of feedback they give in response to their athletes' performances.

This questionnaire is designed to find out what type of coaching feedback your coach gives you in practices and games.

*Coaching Responses to Player's Successes*

Listed below are six examples of feedback your coach might give you after you have had a successful performance in a game or

practice. PLEASE RATE EACH STATEMENT IN TERMS OF HOW TYPICAL YOUR COACH GIVES YOU THIS KIND OF FEEDBACK AFTER YOU HAVE HAD A SUCCESSFUL PERFORMANCE.

1. "Good play!"
2. Coach ignores your good performance.
3. "Way to go! You really extended your elbow that time."
4. "Great play. Now you're keeping you eyes on the ball."
5. "Excellent work in practice today."
6. Coach doesn't say anything to you about your good performance.
1. "That's O.K. Keep working at it!"
2. Coach ignores your error or poor performance.
3. "That was a really stupid play!"
4. "You dropped your elbow. Next time keep it up."
5. "How many times have I told you to extend your elbow?"
6. "Hang in there! You will do better next time."
7. Coach doesn't say anything to you about your error or poor performance.
8. "Your technique looks lousy! Keep you head up."
9. "That play sucked!"
10. "No, that's not right. You need to work on a faster release."

*Not Typical*      *Very At All Typical*  
12345 12345 12345 12345 12345  
12345

*Not Typical*      *Very At All Typical*  
12345 12345 12345 12345 12345 12345  
12345  
12345 12345  
12345

*Coaching Reponses to Player's Errors*

Listed below are ten examples of feedback your coach might give you after you have had made a mistake or committed an error in a game or practice. PLEASE RATE EACH STATEMENT IN TERMS OF HOW TYPICAL YOUR COACH GIVES YOU THIS KIND OF FEEDBACK AFTER YOU HAVE HAD A PERFORMANCE ERROR OR POOR PLAY.

Preferred Coaching Feedback Questionnaire

This questionnaire is designed to find out what type of coaching feedback you would PREFER your coach to give you in practices and games.

*Coaching Reponses to Player's Successes*

Listed below are six examples of feedback your coach might give you after you have had a successful performance in a game or practice. PLEASE RATE EACH STATEMENT IN TERMS OF HOW MUCH YOU PREFER THIS KIND OF FEEDBACK FROM YOUR COACH AFTER YOU HAVE HAD A SUCCESSFUL PERFORMANCE.

1. "Good play!"
2. Coach ignores your good performance.

3. "Way to go! You really extended your elbow that time."
4. "Great play. Now you're keeping you eyes on the ball."
5. "Excellent work in practice today."
6. Coach doesn't say anything to you about your good performance.
1. "That's O.K. Keep working at it!"
2. Coach ignores your error or poor performance.
3. "That was a really stupid play!"
4. "You dropped your elbow. Next time keep it up."
5. "How many times have I told you to extend your elbow?"
6. "Hang in there! You will do better next time."
7. Coach doesn't say anything to you about your error or poor performance.
8. "Your technique looks lousy! Keep you head up."
9. "That play sucked!"
10. "No, that's not right. You need to work on a faster release."

*Do Not Prefer Very Prefer At Much*

*All*

12345 12345 12345 12345 12345

12345

*Do Not Prefer Very Prefer At Much*

*All*

12345 12345 12345 12345 12345 12345

12345

12345 12345

12345

#### *Coaching Reponses to Player's Errors*

Listed below are ten examples of feedback your coach might give you after you have had made a mistake or committed an error in a game or practice. PLEASE RATE EACH STATEMENT IN TERMS OF HOW MUCH YOU PREFER THIS KIND OF FEEDBACK FROM YOUR COACH AFTER YOU HAVE HAD A PERFORMANCE ERROR OR POOR PLAY.

#### **E. Adapted Version of the Intrinsic Motivation Inventory (for runners)**

1. I enjoy running very much.
2. I think I am pretty good at running.
3. I put a lot of effort into running.
4. It is important for me to do well when I run.
5. I feel tense while running.
6. I try very hard while running.
7. Running is fun.
8. I would describe running as very interesting.
9. I am satisfied with my running performance.
10. I feel pressured while running.
11. I feel anxious while running.
12. I don't try very hard at running.
13. While running, I think about how much I enjoy it.

14. After running for awhile, I feel very competent.
15. I am very relaxed while running.
16. I am pretty skilled at running.
17. Running does not hold my attention.
18. I can't run very well.

ADAPTED:

Interest/enjoyment: 1, 7, 8, 13, 17

Perceived competence: 2, 9, 14, 16, 18

Perceived choice/effort: 6, 12

Pressure/tension: 4, 5, 10, 11, 15,

THE ORIGINAL TASK:

interest/enjoyment, perceived competence, perceived choice, and pressure/tension composites on these four then do correlations.

Interest/enjoyment: 1, 5, 8, 10, 14(R), 17, 20

Perceived competence: 4, 7, 12, 16, 22

Perceived choice: 3, 11(R), 15, 19(R), 21(R)

Pressure/tension: 2(R), 6, 9(R), 13, 18

The subscale scores can then be used as dependent variables, predictors, or mediators, depending on the research questions being addressed.

1. While I was working on the task I was thinking about how much I enjoyed it.
2. I did not feel at all nervous about doing the task.
3. I felt that it was my choice to do the task.
4. I think I am pretty good at this task.
5. I found the task very interesting.
6. I felt tense while doing the task.
7. I think I did pretty well at this activity, compared to other students.
8. Doing the task was fun.
9. I felt relaxed while doing the task.
10. I enjoyed doing the task very much.
11. I didn't really have a choice about doing the task.
12. I am satisfied with my performance at this task.
13. I was anxious while doing the task.
14. I thought the task was very boring.
15. I felt like I was doing what I wanted to do while I was working on the task.
16. I felt pretty skilled at this task.
17. I thought the task was very interesting.
18. I felt pressured while doing the task.
19. I felt like I had to do the task.

20. I would describe the task as very enjoyable.
21. I did the task because I had no choice.
22. After working at this task for awhile, I felt pretty competent.

**F. Informed Consent Document:**

This project is being conducted by Julia Harreschou as part of a senior thesis at Scripps College. You are being asked to participate because you are 18 years or older, and a member of either CMS, PP, or Caltech long distance track and/or cross country. The general purpose of this study is to determine if there is a relationship between athletes' abilities to empathize and systemize and their preferred style of coaching and support from fans, friends and family. Furthermore, this study seeks to uncover differences in preferred motivational strategies between athletes with autism spectrum disorders and their neurotypical peers.

It will take approximately 20 minutes to complete the study. Participants should expect minimal risk in answering all the questionnaires in this study. The majority of questions are statements about one's personality and responses to coaches' behaviors that participants rate on a Likert-type scale. The statements/questions are generic in scope, ranging from 'I find social situations easy' to 'I find it difficult to read maps.' Participants will then select one of the following as an answer: strongly disagree; slightly disagree; slightly agree; strongly agree. There will be no monetary or material compensation for your time. Participation is voluntary, and can be stopped at any time without penalty. Data will be anonymous, as participants will be identified only by a random number assigned to them on surveymonkey.com. No names will be recorded, and all interactions via emails, facebook and Autism forums will be deleted upon completion of the study to ensure anonymity.

In case you have any other questions, please contact Julia Harreschou at [JHarresc5406@scrippscollege.edu](mailto:JHarresc5406@scrippscollege.edu) or 310-429-0444, or IRB Administrator Linda Scott at [linda.scott@scrippscollege.edu](mailto:linda.scott@scrippscollege.edu) or at (909)621-8148

If you are in need of counseling services, please contact the American Psychological Association counseling referral service ( [HYPERLINK "http://locator.apa.org/"](http://locator.apa.org/) <http://locator.apa.org/>) (if you attend Caltech), or call the Monsour Counseling Center at (909)621-8202 (if you are a Claremont Colleges student).

Clicking agree indicates that you have read and understood the information and voluntarily choose to participate in the study.

**G. Debriefing Document:**

Thank you for your participation! As a reminder, please do not discuss this study with anyone until it is published. As stated earlier, the purpose of this study is to determine if there is a relationship between athletes' abilities to empathize and systemize and their preferred style of coaching and support from fans, friends and family. Furthermore, this study seeks to uncover differences in preferred motivational strategies between athletes with autism spectrum disorders and neurotypical peers. As a participant, your ability to interpret emotions and affect were tested, as well as your drive to analyze or construct a system, symptoms of autism, goal orientation, and preferred coach support and direction.

In case you have any other questions, please contact Julia Harreschou at [JHarresc5406@scrippscollege.edu](mailto:JHarresc5406@scrippscollege.edu) or 310-429-0444, or IRB Administrator Linda Scott at [linda.scott@scrippscollege.edu](mailto:linda.scott@scrippscollege.edu) or at (909)621-8148

If you are in need of counseling services, please contact the American Psychological Association counseling referral service ( HYPERLINK "<http://locator.apa.org/>" <http://locator.apa.org/>) (if you attend Caltech), or call the Monsour Counseling Center at (909)621-8202 (if you are a Claremont Colleges student).

#### **H. Facebook/email Advertisement**

Hi all! You are being invited to participate in my study as part of a senior thesis at Scripps College. You are being asked to participate because you are 18 years or older, and a member of either CMS, PP, or Caltech long distance track and/or cross country. The general purpose of this study is to determine if there is a relationship between athletes' abilities to empathize and systemize and their preferred style of coaching and support from fans, friends and family. Furthermore, this study seeks to uncover differences in preferred motivational strategies between athletes with autism spectrum disorders and neurotypical peers.

It will take approximately 20 minutes to complete the study. The majority of questions are general statements about one's personality and responses coaches' behaviors. Participation is voluntary, and can be stopped at any time without penalty. Data will be anonymous, as participants will be identified only by a random number assigned to them on surveymonkey.com. No names will be recorded, and all interactions via emails, facebook and Autism forums will be deleted upon completion of the study to ensure anonymity.

In case you have any other questions, please contact Julia Harreschou at [JHarresc5406@scrippscollege.edu](mailto:JHarresc5406@scrippscollege.edu) or 310-429-0444