

Bringing human-animal interaction to sport: Potential impacts on athletic performance

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Abstract

To gain an edge in performance, athletes, coaches, trainers, and sport psychologists worldwide leverage findings from psychological research to develop training and performance strategies. The field of sport psychology draws upon research on stress, anxiety, mindfulness, and team building to develop these strategies. Here, we introduce human-animal interaction as a potential area of research that may apply to athletic performance. Structured interactions with animals—particularly therapy dogs—can provide physiological benefits associated with stress and the oxytocin system, psychological benefits for anxiety and motivation, and social benefits through social support. Yet these effects have not yet been systematically investigated in athletes. Integration of human-animal interactions into athletics can occur through external animals' teams, internal animals' teams, and athlete pet ownership. Integrating human-animal interactions into athletics presents some unique challenges and limitations that must be considered before implementing these programs, and these interactions are not a panacea that will work in every situation. But, given the amount of human-animal interaction research suggesting benefits in medicine, mental health, and education contexts, it is worthwhile exploring potential benefits not just for athletic performance, but also for injury prevention and recovery.

Keywords: athletic performance, human-animal interaction, oxytocin, performance anxiety, sport psychology, stress

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Athletes worldwide constantly strive to improve their performance with new and innovative techniques. Finding even the slightest edge is taken seriously because athletes have the potential to win scholarships to compete in college, or to compete at a professional level and make a career of playing the sport they love. To enhance performance, athletes, trainers, and coaches have relied on strategies developed in the field of sport psychology to reduce stress and anxiety and improve attention, motivation, and team bonding/cohesion. Currently, athletes use many different strategies to gain a performance edge, including mindfulness activities (Josefsson et al., 2017), goal-setting as individuals and as a team (Weinberg, 2013), team retreats, specific breathing patterns (Martarelli et al., 2011; Keilani et al., 2016), and others.

Other research programs outside of sport psychology also investigate strategies that reduce stress and anxiety, improve mood and motivation, and increase social support to enhance performance in domains such as medicine, mental health, and education. Notably, human-animal interactions have been used across these and other domains to achieve the same goals shared by sport psychology to enhance athletic performance. Human-animal interactions are mutual and dynamic interactions between humans and non-human animals that can range from pet ownership to highly structured therapies (Griffin et al. 2011; Thayer & Stevens 2019a). Animal-assisted interventions are a specific form of interaction that are facilitated by a trained handler, researcher, teacher, or therapist to provide psychophysiological benefits to a person or group (Thayer & Stevens 2019b). Though many of the cases described here are animal-assisted interventions, we use the more general term of human-animal interaction to capture other interactions.

These interactions have been investigated across a wide range of situations from classrooms to dentist offices, and, though not universal, they result in benefits in many different situations (Barker & Wohlen, 2008; Maujean et al., 2015). Despite the fact that the benefits of human-animal interaction directly align with the desired improvements in athletic performance, currently no research investigates the effects of these interactions in sports. The purpose of this article is to highlight connections between human-animal interaction research and sport research to begin filling this gap.

There are many potential connections of human-animal interaction research to athletics that we have divided into three primary categories: physiological, psychological, and social processes. Within each primary category, we first explain various theories, mechanisms, and benefits of human-animal interactions in other contexts; then we describe how they connect to sport. While some mechanisms and theories could fall into multiple categories, for the sake of organization, we have placed them into one category.

Physiological processes

Stress

Though stress—a physiological, psychological or emotional response produced by environmental changes—can have positive effects in small amounts, prolonged feelings of stress can cause mental and physical deterioration (Agorastos et al., 2018). Physiological markers of stress include increased cortisol levels, heart rate, and blood pressure. Continually high levels of cortisol—the hormone most associated with stress—can interrupt many of the body’s processes and lead to serious defects of the endocrine system, metabolism, and psychological functioning (Kaltsas & Chrousos, 2007).

Having been a topic of study for decades, the connection between human-animal interaction and stress reduction is well-documented. In one study, researchers had children experience a stressful task and measured cortisol levels before, during, and after the task. During the session, the participants could interact with either a friendly person, a friendly dog, or a toy dog. Children had much lower cortisol

levels after interacting with a friendly dog than a toy dog or friendly person, and children who petted the dog more had lower levels of cortisol than children who petted the dog less (Beetz et al., 2011). Other studies in adults have found that animal interactions can have a stress-buffering effect. Interacting with an animal before a stressor can reduce cortisol levels up to 30 minutes after the stressor ends (Jacobson, 2014; Polheber & Matchock, 2014). However, experimentally induced acute stressors are not required for these effects on cortisol. Interacting with a dog or cat decreased cortisol levels in college students in the absence of a direct stressor (Pendry & Vandagriff, 2019), though college students tend to experience stress at high levels (Adlaf et al., 2001).

The reduction of stress can be observed by changes in other physiological measurements as well as cortisol. Early work in this area showed that even simple interactions such as watching fish in an aquarium can reduce blood pressure in adult participants (Katcher et al., 1984), suggesting a reduction in acute stress as well. Another study found that undergraduates had relatively high blood pressure and heart rate when talking to an experimenter but the low levels of these stress markers when petting a dog (Vormbrock & Grossberg, 1988). The calming effects of human-animal interaction can last well beyond the direct interaction as evidenced by decreased heart rate in female dog owners 55 minutes after a 3-minute interaction with their dogs (Handlin et al., 2011). Individuals who did not interact with a dog showed no decrease in heart rate. Human-animal interactions consistently lead to decreases in cortisol levels, blood pressure, and heart rate, suggesting that they significantly reduce stress.

The application of human-animal interaction research into athletics could have the potential to reduce the physiological aspects of stress, which could improve performance. Physiological markers of stress such as heart rate, oxygen uptake, and energy usage have a linear relationship, so as heart rate increases, more oxygen is needed and more energy is expended (Borreson & Lambert, 2009). Therefore, high heart rates before and during competition could increase energy requirements, potentially exhausting the athlete sooner than expected and negatively affecting performance. Similarly, prior to competition, cortisol levels tend to spike, but if the increase in cortisol is too great, performance declines (Siart et al., 2017). Thus, interacting with an animal may reduce stress physiology that strains the body and negatively affects performance. The stress buffering effects of these interactions are particularly promising for sports because interaction before training and competition can buffer stress occurring during these events. Future research should investigate whether animal interactions can reduce stress responses in athletes as they do other populations and assess whether this improves their athletic performance. If these interactions are beneficial, follow up research can examine the optimal dosages and timing of the interventions to maximize performance gains.

Oxytocin

While stress provides one biological pathway that is affected by interacting with animals, the oxytocin system is another, related pathway. Produced in the hypothalamus and released by the posterior pituitary, oxytocin is a peptide hormone that is a known antagonist of cortisol and other physiological mechanisms of stress (Uvnäs-Moberg, 1998; McQuaid et al., 2016; Love, 2018), so increasing its concentration could lead to a decrease in stress. Oxytocin influences the autonomic nervous system and the immune system, providing anxiety-reducing, analgesic, anti-inflammatory, and antioxidant effects (Carter et al., 2020). Yet oxytocin is more commonly known for regulating functions in lactation, reproduction, and most importantly, social behavior. Oxytocin has been found to positively affect levels of social attention, empathy, trust, and relationship building (MacDonald & MacDonald, 2010; Striepens et al., 2011), although some of these effects have not replicated, suggesting a more complicated relationship between oxytocin and social cognition (Evans et al., 2014; Nave et al., 2015).

Oxytocin has been proposed as a potential mechanism underlying human-animal interactions because its effects mirror benefits observed by these interactions, including reduction of stress, anxiety,

and pain (Beetz et al., 2012). Several studies show that interacting with dogs increases blood levels of oxytocin in participants. Petting a dog for as little as three minutes can increase oxytocin levels markedly (Odendaal & Meintjes, 2003), though these effects are strongest in women (Miller et al., 2009; Handlin et al., 2011). In fact, even just looking at dogs can affect oxytocin levels. In a 30-minute interaction, dog owners who gazed at their dogs more had higher levels of urinary oxytocin than owners who gaze less (Nagasawa et al., 2009). Dogs experience a similar increase in oxytocin when gazing at their owners, suggesting a positive feedback loop between oxytocin and dog-human interaction, possibly due to the co-evolved nature of dog domestication (Nagasawa et al., 2015). This research indicates that oxytocin plays an integral role in human-animal relationships (Beetz et al., 2012).

Despite the research connecting oxytocin to animal interaction, little work has investigated how oxytocin's effects on human-animal interaction might directly influence aspects of social behavior. Yet without making links to oxytocin, many studies have connected human-animal interactions to social behavior. The presence of a friendly animal can stimulate social interactions between humans in what has been dubbed the social catalyst effect. In one study, strangers interacted with a researcher who was either alone or with a teddy bear, a plant, or a dog. Consistently, the participants were more engaged with the researcher when the dog was also present (Wells, 2004). Other studies have examined the long-term effects the presence of a dog can have on sociability. For instance, showed that families engage in more social activities just one month after getting a dog (Paul & Serpell, 1996). Studies investigating having dogs in elementary school classrooms found that students in classrooms with dogs integrated socially with peers more effectively and showed higher levels of empathy than those who did not (Hergovich et al., 2002; Kotrschal & Ortbauer, 2003). Therefore, the human-animal interactions increased social cohesion.

How might increased levels of oxytocin affect athletic performance? In terms of sport research, oxytocin has been shown to improve communication between athletes, whether it be teammates or competitors (Pepping et al., 2012). This is beneficial so the athlete can better read teammates and competitors, thus improving team coordination and allowing for better understanding of the competitor's movements. Amongst teammates, oxytocin increases trust and cooperation and has been shown to increase "in-group favoritism", which has implications for team bonding (De Dreu et al., 2011). A common thread amongst successful teams are strong feelings of commitment, trust, and strong communication to build teamwork (Mickan et al., 2000). Oxytocin can increase these psychological connections needed to perform well together. Having athletes interact with an animal—alone or with other teammates—may increase oxytocin levels and therefore improve team interactions. Athletes may be able to reap the benefits of increased oxytocin after even brief interactions with an animal. Research should investigate whether interacting with an animal increases oxytocin levels in athletes and how long athletes need to interact with an animal to see benefits. Implementing the findings of human-animal interaction research in terms of oxytocin activation into athletics has the potential to improve team bonding and ultimately team performance. Even for individual sports, oxytocin-related effects of human-animal interactions may reduce stress, anxiety, and pain.

Psychological processes

Anxiety

In addition to direct effects on physiological variables such as blood pressure, cortisol, and oxytocin, human-animal interactions can also influence psychological states such as anxiety. Anxiety—the state of feeling excessive worry stemming from nervous system arousal—can cause physical symptoms that inhibit your ability to complete tasks (Spielberger, 1983). Though related to stress, anxiety is a separate psychological state with different causes and effects.

Like stress, the effects of human-animal interaction on anxiety has been well-studied. Shiloh et al. (2003) compared the effects of petting a rabbit, a turtle, a toy rabbit, a toy turtle, or nothing on self-reported anxiety levels and found that only petting the live animals reduced anxiety. Lang et al. (2010) found that the presence of a dog during a clinical interview was correlated with a reduction in self-reported anxiety in patients with acute schizophrenia. These reductions in anxiety may be lasting, too. Psychiatric patients who participated in a 12-week intervention program with farm animals reported decreased levels of anxiety 6 months after completing the program (Berget et al., 2011). The use of aquaria also reduces anxiety in electroconvulsive patients in waiting rooms (Barker et al., 2003b) and increases food intake among Alzheimer's patients, whose confusion and agitation often impedes their food intake (Edwards & Beck, 2002). Hippotherapy—the use of horseback riding as a means of physical rehabilitation—promotes feelings of self-worth and value among its patients (Blue, 1986). Other forms of anxiety and distress can be reduced by interacting with animals such as therapy dogs (Grajfoner et al., 2017; Crossman et al., 2018). By and large, most of the data collected regarding human-animal interaction and anxiety suggests that these interactions reduce anxiety and promote calmness.

Performance anxiety is a common problem for elite athletes that can negatively affect performance, and, if untreated, can lead to more serious psychological disorders (Ford et al., 2017). Performance anxiety shares cognitive and physiological responses with general anxiety- the only difference being the stimulus causing anxiety is sport performance (Hanin et al., 2000). Since performance anxiety is just a subcategory of general anxiety, it is logical to conclude that athletes would experience the same positive effects on performance anxiety from interaction with animals as described above. The effects on performance anxiety on performance tend to be negative and include a loss of attention and focus, forgetfulness, difficulty with making decisions, muscle tension, fast heart rate, fast breathing, poor communication, unfriendliness, and reduced productivity (Khan et al., 2017). All of these symptoms have the ability to negatively affect every aspect of performance from physiological ability, cognitive capacity, and ability to be a good teammate. There are several treatments for performance anxiety, such as cognitive behavioral therapy (Bandelow et al., 2017), acceptance and commitment therapy (Hayes et al., 2004), and various mental performance skills (Vealey, 2007). Yet each individual athlete is different, and finding a method that works can be a long and challenging process. The known benefits of human-animal interaction on anxiety could also be applied to performance anxiety in athletics to treat and reduce performance anxiety. Using animals in the treatment of performance anxiety could lead to new ways to improve treatment outcomes, thus helping more athletes.

In athletics, the Individual Zones of Optimal Functioning (IZOF) theory explains how each individual athlete has a specific emotional state that they perform best in (Kamata et al., 2002). If they are not emotionally aroused enough, the athlete will not perform their best, and if they are too emotionally aroused they will also not perform well. The optimal zone for performance varies greatly amongst athletes, and many factors go into determining the optimal zone (Kamata et al., 2002; Hanin et al., 2002). Sport psychologists will often work with athletes to help them identify their optimal functioning zone and then find ways to achieve that state before a performance. Given the effects of human-animal interaction on arousal, interaction with an animal could help lower emotional arousal enough to achieve a good performance. This technique would not be suitable for an athlete that needs to increase emotional arousal, but it could potentially be another resource to calm athletes and improve their performance.

Motivation

Motivation—the drive that produces goal-directed behavior (Longe, 2016)—is another important psychological variable that is affected by human-animal interaction. Researchers have observed

increased social motivation in both autistic children (Bass et al., 2009) and schizophrenic adults (Nathans-Barel et al., 2005) who have interacted with an animal. For instance, obese children are more physically active in the presence of a dog, suggesting that interacting with animals may promote intrinsic motivation via the activation of implicit motives (Wohlfarth et al., 2013). Such change in motivation is potentially explained by drops in cortisol and spikes in dopamine and serotonin (Odendaal and Meintjes, 2003) that have been observed to follow human-animal interaction. Research has found that animal interactions increased intrinsic motivation (Wohlfarth et al., 2013). They proposed that by increasing implicit motives, the animals helped the humans improve performance drastically. With the motivational effects of animals in mind, some educators have begun promoting reading-to-dog programs that are designed to promote self-efficacy and keep young readers motivated to improve. Thus far, these programs appear to be successful in their goals, but more data are needed before any conclusions can be drawn (Hall et al., 2016).

In athletics, a common problem with athletes is burnout, which is defined as “an individual syndrome including emotions, attitudes, motives, and expectancies” (Maslach and Leiter, 1997). In Maslach’s model, the main components are “emotional exhaustion, depersonalization (loss of social interest), reduced personal accomplishment, and involvement” (Hanin et al., 2000). Lack of motivation is positively associated with burnout syndrome, and in contrast, intrinsic motivation is negatively associated with experiencing burnout (Lonsdale et al., 2011). One theory for burnout is that too much stress and exhaustion without enough recovery creates the feeling of burnout (Goodger et al., 2007). One study found that self-determined motivation is negatively associated with burnout (Lonsdale et al., 2011). This means that increasing intrinsic motivation helps keep athlete’s engaged in their sport and avoid burnout syndrome. Given the described benefits of human-animal interaction on intrinsic motivation, it is reasonable to think these effects could be used to improve athlete motivation in sport. Integrating human-animal interactions into training programs could potentially help increase intrinsic motivation, and ultimately performance. Applying human-animal interaction research into athletics could lead to a decrease of athletes who experience burnout syndrome, ultimately keeping more athletes involved and enjoying their sport for longer.

Social processes

Social support

Social support involves strong interpersonal bonds that provide a buffer against adversity, reinforce self-esteem, and promote resilience (Ozbay et al., 2007). Social support has key connections to both stress and oxytocin systems. Social support can serve to reduce stress in many ways, including boosting feelings of self-efficacy (Wilkes & Spivey, 2010) and reducing perceived burdens (Shurgot & Knight, 2005). In addition, social support increases oxytocin release, strengthening interpersonal bonds and reducing stress (Olf, 2012).

Most humans approach animals with an openness and trust that increases with physical contact through the oxytocin system (Beetz et al., 2011; Julius et al., 2013). Seeking to explain the popularity of cats amongst humans, Stambach & Turner (2015) found that cats provided an additional source of emotional support for their owners, and in some cases, even supplanted humans in their owners’ social networks. The presence of a dog can even affect how someone is perceived. Gueguen & Cicotti (2008) found that individuals observed with a dog were more likely to receive help or someone’s phone number than those without a dog. In another study, college students were presented with videos of two different psychotherapists, with one of the therapists having a dog and the other not. The psychotherapist with the dog was seen as more trustworthy by the students, particularly by those with negative attitudes toward psychotherapists (Schneider & Harley, 2006). Patients in substance abuse treatment rate therapists with

dogs more positively than therapists without dogs (Wesley et al., 2009) The presence of animals can help build stronger social bonds among people.

The social support findings of human-animal interaction research could have important implications in athletics. In athletics, psychological safety is a belief that the team is safe for interpersonal risk taking (Edmondson et al., 2014). Psychological safety is therefore built on a foundation of trust and strong interpersonal bonds with teammates and coaches. Potentially mediated by the oxytocin system, the effects of human-animal interaction on social support could serve to improve relationships between teammates and between athletes and coaches so that athletes can have increased psychological safety. This could improve performance both by encouraging the coach to be more willing to devote time and attention to the athlete and by offering the athlete a feeling of safety to make mistakes and learn from them. Studies have shown that positive relationships with coaches and athletic performance are positively associated (Davis et al., 2018), and having a good relationship with the coach has a negative association with burnout rates in athletes (Isoard-Gautheur et al., 2016). Applying human-animal interaction research to athlete-coach relationships could potentially improve relationships, heal damaged relationships, and lead to better performance from the athlete.

Integrating human-animal interaction into sports

There are at least three ways to integrate human-animal interaction into athletics programs in non-invasive, sustainable ways: external animal teams, internal animals teams, and athlete pet ownership. An approach requiring the least investment and commitment from the athletic program is to work with a local organization that provides service or therapy animal visitation programs. These organizations often bring trained teams of service or therapy animals to schools, college campuses, nursing homes, and hospitals to give people the opportunity to reap the health and well-being benefits of interacting with the animals. Bringing trained animal-assisted therapists or other animal handlers into sport psychology departments could be a way to test out the effects of these interactions on athletes without a costly initial investment. This approach has the benefit of capitalizing on the expertise of trained animal therapy personnel to help develop a programmatic approach to incorporate human-animal interaction into the athletics program. A key disadvantage is that scheduling animal-assisted activities depends on availability of people outside of the athletics program. This could be particularly problematic when events are scheduled in evenings and weekends. But it offers a useful starting point for incorporating animal interactions into sports.

For organizations ready to commit more time and resources into an animal interaction program, they can have designated animal handlers in the department. This could involve either training existing personnel and their animals or hiring animal handlers specifically for their skills and expertise. Handlers could be involved in activities in athletic training rooms and practice areas or requested to be present at various team activities and competitions. The advantage of in-house handlers is greater flexibility in scheduling and availability. Moreover, having the same animal-handler pairs means that the athletes will be more familiar with the animals, which may facilitate stronger relationships with those animals and may reduce the potential distractions associated with novel animals. In addition, having internal handlers means that they are familiar with the activities and facilities, which facilitates more comfortable interactions between the handler and athletes. Having internal animal handlers will increase the flexibility and comfort with the animal interactions.

Finally, athletic departments may encourage pet ownership amongst athletes. Owning pets has been associated with a number of health and well-being benefits, though there are issues with some of these studies (see Challenges for human-animal interaction in sports). In particular, pet ownership is associated with reduced stress and a more active lifestyle (Barker & Wolen, 2008). However, pet

ownership may be difficult for athletes given their busy schedules and the time required to adequately care for a pet. To facilitate this, athletic departments could create programs that make it easier for an athlete to handle the demands of being a pet owner, like providing care for pets while an athlete trains and competes. While there may be long-term benefits to owning a pet, this solution lacks the short-term benefits that may be particularly useful for improving athletic performance. It is likely infeasible for athletes to bring their pets to practices and competition, especially when considering the number of athletes training and competing simultaneously in a department. Instead pet ownership may be more beneficial in reducing stress and motivating more activity at home.

Challenges for human-animal interaction in sports

Human-animal interaction research provides many potential avenues for improvement in athletics, but this research has limitations. This field of research is still fairly new. Some early research lacked proper experimental designs and controls (Wilson & Barker, 2003; Serpell et al., 2017). For example, much of the research on pet ownership is correlational, making the direction of causation difficult to assess (does owning a pet affect health or are healthy individuals more likely to own a pet?). Research designs without randomized controlled trials pose difficulties for drawing strong inferences about the effects of human-animal interaction on people's health and well-being. And the precise format of the control is critical to assess the role of the animal (Friedmann & Gee, 2019). Further, some of the research questions have demonstrated mixed results. For instance, while interacting with or caring for animals reduces psychological distress in some studies, it has no effect or even increases distress in other studies (Crossman, 2017). The mixed results in some cases may be due to the challenges of conducting research with animals combined with variation in methodology. The field of human-animal interaction is continuing to develop a core theoretical framework and standard methodological best practices (Serpell et al., 2017).

Another key limitation of any kind of intervention is that people respond differently to the same stimulus, so what works for some might not work for another. Individual differences such as attitudes towards animals can moderate how animal interactions influence physiological measures of stress such as blood pressure (Friedmann et al., 1993). Applying this to athletics, some athletes could benefit from interacting with animals, while others may see it as a distraction or potential stressor. Some individuals have aversion or allergies to animals. Others are simply indifferent to or do not prefer animals. Forcing these individuals to interact with animals could counteract any potential benefits. Determining what characteristics of athletes may make them good candidates for human-animal interactions is a key challenge that requires future research.

A final limitation is the practicality of conducting human-animal research in athletics and integrating animals into sports. Athletes can be a very protected group with severe limitations on their time, making it difficult to get the necessary permissions from coaches and athletic departments to conduct research. There are dozens of different sports, and each sport would have different practice times, rules for the game, and workout settings, so any research would have to be adjusted to fit the specific nature of each sport. Integrating animal interactions more permanently into athletics could present its own set of challenges. The training and responsibility of animals can be expensive and time consuming. Athletic departments would have to decide between repeatedly bringing in therapists and professionals from outside of the institution versus placing the burden of training and maintaining therapy/support animals on employees. Either way, the animal and handlers must be properly trained and there must be safeguards in place to ensure the welfare of the animals. This may be particularly taxing in large athletic institutions, and multiple animals may be required to balance the high demand for

their services with the welfare issues raised with these demands. Partnering with a local therapy dog organization may offer a fruitful solution to these issues.

Future directions

Here, we have focused on the benefits of human-animal interaction on the sport psychology side of athletic performance. A promising direction for future research involves extending human-animal interaction research into sports medicine to investigate its effects on pain, injury prevention, and injury treatment. Interacting with animals can significantly reduce pain in patients with chronic pain levels (Marcus et al., 2012) or acute pain (Coakley et al., 2009). After interacting with an animal, children reported a significant reduction of pain compared to children who did not interact with an animal (Braun et al., 2009). After canine visitation therapy, children who had been through surgery and were experiencing pain post-operation reported a decrease in perceived pain (Sobo et al., 2006). These findings suggest that interacting with animals can distract people from pain and to a more comforting outlet (the animal). This process could be a result of oxytocin system activation. Many studies have found that administering oxytocin to various animal species increased their pain tolerance (Rash et al., 2014). In humans, the results are more mixed, but oxytocin as a source for analgesia has some promising research (Boll et al., 2018). Human-animal interactions increase oxytocin in humans (see “Oxytocin” section), indicating that these interactions could produce the analgesic effect triggered by oxytocin release. Applying all of these findings to the context of injuries in sport suggests that implementing animals into sports medicine could help reduce the occurrence of injury, reduce the pain felt once injury occurs, or even help rehabilitate injury faster.

These findings are already being implemented in the athletic training department at the University of North Carolina. The National Athletic Trainers’ Association has begun teaching entry level trainers about sport psychology techniques to reduce distress, especially in times of injury, and trainers report feeling that psychological interventions help with the rehabilitation process after a physical injury (Hamson-Utley et al., 2008). Given the reduction of distress for patients with psychological pathologies who interacted with an animal, it is possible that an athlete in distress after injury could benefit from similar interventions. A program like this has already been implemented at the University of North Carolina with the men’s baseball team. A trained therapy dog named Remington joined the team and helped athletes in their rehab routines. The athletic trainer, coaches, and team members all reported fewer injuries, faster recovery, and higher morale overall (Capatides, 2017). Collegiate athletes reported greater satisfaction after they recovered from injury if they had more social support, and researchers theorized that social support from athletic trainers and coaches needed to be improved (Yang et al., 2010). Future research should be conducted to determine if interacting with an animal after injury really does improve recovery outcomes, how often does an athlete need to work with an animal, what phases in the recovery process interacting with an animal would be most beneficial, and multiple ways animals can be integrated into the recovery process for athlete’s. Using human-animal research in injury recovery programs could lead to more positive outcomes in less time than traditional methods of treatment, allowing an athlete to avoid some of the negative psychological effects of injury and returning to their sport faster.

Conclusions

The research and theories described here show multiple avenues for human-animal interaction to benefit athletes including stress, oxytocin system activation, anxiety, motivation, and social support. This burgeoning field of research is discovering and clarifying the role of animal interactions on many forms of physical and mental health and well-being. As a starting point into this literature, there are a number

of reviews of the effects of human-animal interaction generally (Nimer & Lundahl, 2007; Barker & Wolen, 2008; Hosey & Melfi, 2014; Maujean et al., 2015; Wells, 2019), as well as specific effects on stress (Beetz et al., 2012; Pendry & Vandagriff, 2020) and anxiety (Beetz et al., 2012). The integration of animals into athletics and sport psychology could provide new and exciting ways to improve performance. While there is potential for many benefits, human-animal interaction is not a panacea, and will not solve every problem for every athlete. Some effects of these interactions are unreliable, and individuals differ in their responses to these interactions. Additionally, integrating animals into athletic programs presents some unique challenges that would require creative solutions, including time and cost constraints. Future research is necessary to determine the viability and benefits of human-animal interaction in sports, and other ways to implement human-animal interaction into athletics outside of sport psychology.

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Data availability statement

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

Author contributions

The authors made the following contributions. Sutton Marvin: Conceptualization, Investigation, Writing - Original Draft Preparation, Writing – Review & Editing; Kennet Sorenson: Investigation, Writing - Original Draft Preparation, Writing – Review & Editing Jeffrey R. Stevens: Conceptualization, Investigation, Supervision, Writing - Original Draft Preparation, Writing – Review & Editing.

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