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Overview of Centers and Institutes for Human-Animal Interaction in the United States

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Academic centers and institutes represent critical hubs for the advancement of areas of scholarly and societal interest. We conducted a survey of 16 academic centers and institutes for human-animal interaction (HAI) in the United States to systematically document the current state of academic interest and investment in the field. Areas of focus included demographics, research, engagement, and education. Results indicated a substantial growth of new centers since 1977, particularly over the past decade. Research topics focused primarily on companion animals (largely dogs, cats, and horses) and adults. Engagement efforts centered around online outreach and in-person programming, with 75% of centers providing animal-assisted intervention services. Education opportunities included degrees at the undergraduate (13%), Masters (50%), and Doctoral (25%) level with courses offered in 63% of centers. The growth and productivity of academic centers and institutes for HAI provides evidence for the growing academic influence of the burgeoning field of HAI. The infrastructure these centers provide will be essential in supporting larger-scale research projects, promoting interdisciplinary and community-based research, and educating future leaders of the field.

Keywords: academic center, institute, research, engagement, education, human-animal bond, human-animal interaction

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Academic interest in the human-animal bond dates back nearly 50 years when Lynch and McCarthy first reported the benefits of human-animal interaction on the health of the human heart (Lynch & McCarthy, 1969). Human-animal interaction refers to interactions between a person and a non-human animal (e.g., relationships with companion animals, animal-assisted interventions); the human-animal bond refers to a reciprocal and mutually beneficial relationship between a person and a non-human animal (American Veterinary Medical Association, 2017). The fields of human-animal interaction and the human-animal bond are commonly referred to as HAI. The growth of objective evidence on HAI established the scientific worth of investigation on the topic. In the 1970's, university-affiliated centers began to appear, many of which were affiliated with colleges of veterinary medicine.

Academic centers and institutes develop to unite critical masses in the advancement of targeted, interdisciplinary scholarship (Mallon & Bunton, 2005). Their development represents the validation of the importance of a particular academic domain (Sá, 2008). The domain of HAI has become the focus of academic centers and institutes around the nation and globally. The existence of centers and institutes not only validates the importance of the field, but also directly contributes to the field's progress (Hines, 2003). Academic centers and institutes serve as vital hubs for garnering research funding, educating students, and serving the community through engagement programming (Stahler & Tash, 1994). The activities and achievements of centers often drive and represent the field. Thus, to evaluate the status of the field of HAI, we identified and surveyed academic centers and institutes in the United States focused on human-animal interaction and the human-animal bond.

The impetus for this project stemmed from the 2006 Purdue Centers for Human-Animal Bond Conference. The conference proceedings included a targeted review of HAI in North America, with eight centers located in the United States (US; Rowan, 2008). The development, funding, and structure of the centers were reviewed qualitatively. The state of centers in 2006 included variable funding structures (predominantly from foundations and the pet-food industry) and hosting primarily by veterinary colleges and institutions. The conference identified two areas for growth: increasing funding from the US companion animal market and implementing HAI courses in the educational curriculum. To examine these and other growth areas, we conducted a follow-up study in conjunction with the 2016 Purdue Centers for Human-Animal Bond Conference. We aimed to document the progress and development of HAI centers and institutes over the past decade. We conducted a mixed methods survey with both quantitative and qualitative data to evaluate the current state of academic centers and institutes focused on HAI in the United States. The target areas for the survey included demographics, research, engagement, and education.

Research

Research within the field of HAI has experienced rapid growth over the last decade (McCune et al., 2014) in terms of volume, breadth, and methodological rigor. Such scholarship has encompassed a wide array of topics from animal-assisted intervention (Hoagwood, Acri, Morrissey, & Peth-Pierce, 2017; O'Haire, 2017), animal-assisted education (Gee, Fine, & Schuck, 2015; Hall, Gee, & Mills, 2016),

pet ownership (Cassels, White, & Gee, 2017; Herzog, 2011; Branson, Boss, Cron, & Kang, 2016), and the impact of HAI on animal health and well-being (McKinney, Mueller, & Frank, 2015; Ng et al., 2014). Empirical research is a key driver of the field as a whole, informing evidence-based practice that shapes education and engagement efforts. One driving force behind the increase in HAI research, and an indicator of the increasing presence of HAI as a standalone research field, is the development of dedicated funding for HAI scholarship from sources such as the National Institutes of Health (NIH)-MARS-WALTHAM public-private partnership, the Human-Animal Bond Research Institute (HABRI), the Horses and Humans in Research Foundation (HHRF), and others.

Although research in HAI has increased significantly in the last decade, there are still challenges to the existing evidence base, and there have been recent calls for further improvements in methodological rigor (Kazdin, 2017). Given the importance of research in continuing to shape the field of HAI, it is critical to evaluate the role that centers for the human-animal bond can take in fostering research initiatives. In particular, it is important to understand the type of research being conducted within HAI centers with regard to type of animal, topic of research, age of human population, and use of different types of methodologies. Identifying how HAI centers fit into the research landscape is crucial in understanding the state of the field.

Engagement

Engagement is defined as a collaboration between an organization and the community in which a beneficial exchange of knowledge, resources, and services exists in the context of partnership and reciprocity (Driscoll, 2008). Examples of organizational engagement include providing service, communication, and education to the community. This is an important component of a human-animal bond center because it serves as a method of conveying an organization's mission, values, and outcomes to its stakeholders. Engagement encourages participation in a center's activities and may enhance both financial as well as volunteer support if the community has a vested interest in the organization's success. The relationship between the organization and community becomes mutually beneficial in this fashion because the organization provides education as well as unique services, such as animal-assisted intervention programs, in exchange for community support.

Engagement benefits the field of HAI because it is the way in which an organization communicates and educates the public about this area of work. The larger the population an organization is able to engage, the greater the impact and awareness it will bring to the field. The degree of engagement that HAI centers have demonstrated has not been measured previously, although it is believed that most centers actively participate in these types of activities. The engagement purpose of this survey was to quantitatively assess the current frequency of and types of engagement activities that exist in HAI centers across the US.

Education

Given the prevalence of animal assisted intervention (AAI) programs (O'Haire, Guérin, & Kirkham, 2015) and rapid growth of HAI research (McCune et al., 2014), the need for formalized coursework and educational opportunities is clear. For example, AAI practitioners require training in best practices that are

based on up-to-date, rigorous studies (Kazdin, 2017), and individuals going into animal advocacy must have not only the skills required to lobby for their cause but an understanding of the needs of the animals for which they are working. Furthermore, education about the human-animal bond specifically geared toward veterinarians may help them build lasting relationships with clients. A recent survey of pet owners conducted by the HABRI Foundation in collaboration with the Cohen Research Group found that the majority of pet owners would have a more favorable view of their veterinarian if he or she discussed with them the health benefits associated with the human-animal bond (HABRI, 2016). Finally, career opportunities are emerging for individuals who have added interdisciplinary HAI coursework to their more traditional fields of study. For instance, some veterinary practices hire social workers who have specialized training in HAI. Such individuals may offer grief counselling to clients and develop programs for staff that help combat burnout and compassion fatigue (Larkin, 2016). Despite the need for training programs for researchers and practitioners, the role of academic centers in HAI education is currently unknown.

Taken together, the aims of this study were to systematically collect information from HAI centers and institutes in the United States. We aimed to assess the demographics, research, engagement, and education practices of each center.

Methods

Participants

A librarian data specialist conducted an internet search to identify HAI academic centers throughout the US based on the following criteria: formally recognized academic centers or institutes with a targeted focus on human-animal interaction or the human-animal bond. Having a broad definition of an academic center not only allowed for greater variability, but more importantly to better capture the state of the field in academic settings. This search led to a list of 17 academic centers. The director of each center was invited to participate in the survey between September and October of 2016. Three additional centers were identified through snowball sampling and were invited to participate in January of 2017. One round of follow up emails was sent to prospective participants if they had not completed the survey within a two-week period. A total of 16 out of the 20 Centers responded to the survey.

Procedure

The study protocol was approved by the Purdue University Human Research Protection Institutional Review Board (IRB Protocol 1609018173). No interactions occurred between the research team and animals during the course of the study; therefore, a waiver was obtained from the Purdue University Institutional Animal Care and Use Committee (IACUC).

All 20 centers were invited via a standardized email to participate in an online survey hosted by Qualtrics Survey Software. Invitations were sent to the center director and instructions recommended that the director complete the survey in collaboration with any key personnel. The survey was developed by members of the Organization for Human-Animal Interaction Research and Education (OHAIRE) lab at the Center for the Human-Animal Bond at Purdue University in preparation for the Centers for the Human-Animal Bond Conference. Survey questions were designed to capture data

Table 1. Demographics – Center establishment timeline and affiliations

Year Founded	University	College/School	Center Name
1977	University of Pennsylvania	Veterinary Medicine	Center for the Interactions of Animals and Society (CIAS)
1981	University of Minnesota	Public Health	Center to Study Human-Animal Relationships and Environments (CENSHARE)
1982	Purdue University	Veterinary Medicine	Center for the Human-Animal Bond (CHAB)
1984	University of California, Davis	Veterinary Medicine	Formerly the Center for Animals in Society* (CAS)†
1986	University of Tennessee	Veterinary Medicine	Human Animal Bond in Tennessee (HABIT)
1997	Tuskegee University	Veterinary Medicine	Center for the Study of Human-Animal Interdependent Relationships (CSHAIR)
2001	Virginia Commonwealth University	Medicine	Center for Human-Animal Interaction (CHAI)
2005	University of Denver	Social Work	Institute for Human-Animal Connection (IHAC)
2005	University of Missouri	Veterinary Medicine	Research Center for Human Animal Interaction (ReCHAI)
2007	Virginia Tech	Veterinary Medicine	Center for Animal and Human Relationships (CENTAUR)
2011	Canisius College	Arts and Sciences	Anthrozoology Master's Program (AMP) †
2012	University of Pennsylvania	Veterinary Medicine	Penn Vet Working Dog Center (PVWDC)†
2013	Oakland University	Nursing	Center for Human Animal Interventions (OCHAI)†
2014	University of Arizona	Agriculture & Life Sciences	Human-Animal Interaction Research Initiative (HAIRI)
2015	Tufts University	N/A	Tufts Institute for Human-Animal Interaction (TIHAI)
2015	Washington State University	Veterinary Medicine	Center for the Study of Animal Well-Being (CSAW)

Note: This is not an exhaustive list of HAI centers in the US. Only those who responded to the survey are included.
*The Center for Animals in Society reported that they were no longer a formal center; however, they were included given their past status as a formal center. † = The center does not use this acronym; it is only used for the sake of identification in this article.

regarding four key areas: (1) demographics, (2) research, (3) engagement, and (4) education. The demographic section was intended to provide basic information such as the age of the center and key personnel while the sections that followed were developed to encapsulate specific areas central to academic centers (Stahler & Tash, 1994). The survey was refined based on feedback from experts in the HAI field. The full list of survey questions is presented in Appendix 1. The data were exported from Qualtrics and basic descriptive statistical analyses (e.g. mean, standard deviation, frequency, percentage) were conducted by the first and second authors.

Results

Demographics

A total of 16 centers participated in the online survey. As shown in Figure 1, they were founded between 1977 and 2015 (Table 1). The age of centers was fairly evenly split between three ranges: 30-40 years (31%, n = 5), 10-20 years (31%, n = 5), <10 years (38%, n = 6), though there was a 10-year gap in which no centers were founded (20-30 years). The majority of centers were affiliated with or housed in a College of Veterinary Medicine (62%; n = 10). The number of directors ranged from 1 – 3 (M = 1.38, SD = 0.62). In nearly half

of centers, at least one of the directors was a veterinarian (44%, *n* = 7).

The faculty composition of centers consisted of a combination of tenure track, clinical, and visiting faculty. The total number of faculty in each center ranged from 1 – 10, with an average of number of 3.5 (*SD* = 3.48) faculty members per HAI center. The majority of centers (75%, *n* = 12) housed tenure track faculty; the number in each center ranged from 0 – 10 (*M* = 2.14, *SD* = 2.63). Clinical faculty were in 63% (*n* = 10) of centers; the number in each center ranged from 0 – 5 (*M* = 1.42, *SD* = 1.38). Visiting faculty were less common, being found in 25% (*n* = 4) of centers with a range of 0 – 4 in each center (*M* = 1.00, *SD* = 1.41). Undergraduate students at each center were differentiated between paid (range: 0 – 10, *M* = 2.19, *SD* = 3.10) and unpaid students (range: 0 – 22, *M* = .4.81, *SD* = 6.55). Few centers (19%, *n* = 3) hired non-student research assistants.

All but three centers (81%, *n* = 13) had at least one administrative assistant to facilitate their operations. Funding for centers was obtained from a range of sources, most commonly through individual donors and bequests (88%, *n* = 14). Other sources of funding included the university (62%, *n* = 10), industry (56%, *n* = 9), foundations (50%, *n* = 8), other sources (44%, *n* = 7), and tuition income (19%, *n* = 3).

Research

Nearly all centers conducted research focused on companion animals (94%, *n* = 15). Other categories of animals were studied less frequently: wild and zoo animals (38%, *n* = 6 each), followed by agricultural and urban animals (19%, *n* = 3 each), and laboratory animals (13%, *n* = 2). One center (6%) reported not researching any non-human animal species. Three centers (19%) reported conducting research with an "other" type of non-human animal (not companion animal), though none included what they were. Dogs were studied by every center who studied companion animals (94%, *n* = 15, see Figure 2). The next most common companion animals studied were cats and horses (60%, *n* = 9 each) followed by small mammals (40%, *n* = 6). One quarter (*n* = 4) of the centers reported conducting research with an "other" type of companion animal.

Issues centered on companion animals were also the most common areas of HAI studied (69%, *n* = 11; see Table 2). The most common topics of research were the effects of companion animal ownership (69%, *n* = 11), quantifying the human-animal bond (63%, *n* = 10), and animal-assisted activities (56%, *n* = 9). Half of centers (50%, *n* = 8) selected the "Other" category, where dogs remained a focus. Qualitative comments indicated that additional topics related to dog training, canine cognition, and working dogs. Collaboration between HAI centers was reported in 63% (*n* = 10) of centers. International collaboration was also reported in 63% (*n* = 10) of centers.

The majority of HAI centers conducted research with a range of ages. Only one center selected a single age group of study. Adulthood was the most commonly studied age group (94%, *n* = 15), followed by older adults (75%, *n* = 12), early adolescence (56%, *n* = 9), middle childhood and late adolescence (50%, *n* = 8 each), and early childhood (25%, *n* = 4). Typically developing adults and children were another common population of interest (81%, *n* =13; see Table 3).

All centers reported using multiple research methodologies. Survey and behavioral assessment techniques were the most commonly used (94%, *n* = 15 each) followed by physiology (81%, *n* = 13; see

Table 4). Only one center was not currently conducting research. Half (50%, n = 8) of the centers had developed a methodological tool.

Figure 2. Percent of centers conducting research on different species of companion animals.

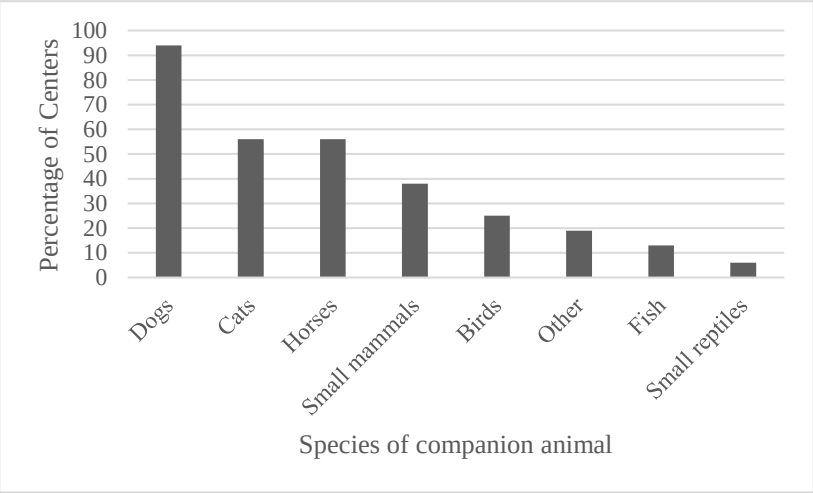

Table 2. Research – Area of human-animal interaction (HAI)

HAI Research Area	% (n)
Companion animals	**69% (11)**
Companion animal ownership	69% (11)
Pet care	13% (2)
Pet loss/grief	6% (1)
Animal assisted intervention (AAI)	**81% (13)**
Animal-assisted activities (AAA)	56% (9)
Service/assistance animals	44% (7)
Animal-assisted therapy (AAT)	38% (6)
Animal-assisted education (AAE)	19% (3)
Emotional support animals	13% (2)
Reading program	13% (2)
Methods	**69% (11)**
Quantifying the human-animal bond	63% (10)
Instrument development	50% (8)
Animal welfare	**44% (7)**
Other	**19% (3)**

Table 3. Research – Populations

HAI Research Population	% (n)
Typically-developing	**81% (13)**
Adults	63% (10)
Children	44% (7)
College students	38% (6)
Veterinary students	31% (5)
Psychological	**56% (9)**
Depression	44% (7)
Posttraumatic stress disorder (PTSD)	38% (6)
Autism spectrum disorder (ASD)	31% (5)
Anxiety disorders	25% (4)
Attention deficit hyperactivity disorder (ADHD)	19% (3)
Dementias	13% (2)
Domestic violence	13% (2)
Learning disabilities	13% (2)
Externalizing disorders	6% (1)
Substance abuse	6% (1)
Physical	**50% (8)**
Cancer	25% (4)
Ambulatory disabilities	13% (2)
Blind or vision impaired	13% (2)
Diabetes	13% (2)
Seizure disorders or epilepsy	13% (2)
Traumatic brain injury	13% (2)
Deaf or hearing impaired	6% (1)
Other	**19% (3)**

Table 4. Research – Methodology

Research Methodology	% (n)
Survey	**94% (15)**
Standardized surveys	88% (14)
Non-standardized surveys	56% (9)
Experience sampling/daily diaries	31% (5)
Behavior	**94% (15)**
Animal behavior	81% (13)
Human behavior	63% (10)
Physiology	**81% (13)**
Animal stress hormone physiology	50% (8)
Heart rate/variability	44% (7)
Blood pressure	31% (5)
Human stress hormone physiology	25% (4)
Oxytocin (human or animal)	19% (3)
Electrodermal activity	6% (1)
Epidemiology	**69% (11)**
Qualitative	**63% (10)**
Other	**13% (2)**

Engagement

A large proportion of the centers engaged in non-research community engagement programs (81%, *n* = 13). Animal-assisted interventions (AAI) and interactions with companion animals were often the central feature of these programs (75%, *n* = 12; see Table 5). All of the 13 engagement centers collaborated with another organization in the implementation of some (69%, *n* = 11) or all (13%, *n* = 2) of these programs (see Table 6). Eight centers (50%) had sponsorship for their community engagement programming. Of the seven centers that had used engagement programs for fundraising; five had raised funds for their own center, one for a partner organization, and one had fundraised for both their center and a partner organization. Twelve centers reported their longest-running community program, which ran from 1 – 30 years (*M* = 11.83, *SD* = 8.71).

Nearly all centers had a presence on the internet, most commonly through a website or blog (81%, *n* = 13) or Facebook (56%, *n* = 9). Other forms of internet engagement included print or emailed newsletters (38%, *n* = 6), other (32%, *n* = 5), other online social networks (19%, *n* = 3), and Twitter (13%, *n* = 2). Only one center did not engage in any outreach activities. Twelve (75%) centers regularly held public events, such as invited speakers (63%, *n* = 10), other regular events (38%, *n* = 6), conferences (31%, *n* = 5), and workshops (31% *n* = 5). Five centers (31%) provided "other" ways they participated in outreach: two (13%) cited university generated press releases, one (6%) reported their research publications, one (6%) reported on-site and distance learning, and one (6%) reported creating a website devoted to animal behavior tools.

Table 5. Engagement – Types of non-research programs

Non-research program	% (n)
Animal assisted interventions (AAI)	**75% (12)**
Animal-assisted activities (AAA)	63% (10)
Animal-assisted therapy (AAT)	44% (7)
Training for AAI	44% (7)
Animal-assisted education (AAE)	25% (4)
Service/assistance animals	25% (4)
Physical activity	19% (3)
Companion animals	**75% (12)**
Pet/animal education	50% (8)
Pet loss/grief	44% (7)
Veterinary services	25% (4)
Pet care	6% (1)
Other programs	**69% (11)**
Other Engagement	**13% (2)**

Table 6. Engagement – Partner organizations

Partner Organization	% (n)
Educational facilities/organizations	**69% (11)**
Local school	50% (8)
Student club	50% (8)
Healthcare facilities	**63% (10)**
Non-residential facility	44% (7)
Residential care facility	38% (6)
Non-profit organizations	**56% (16)**
Animal shelter	44% (7)
Volunteer organization	38% (6)
Animal rescue group	13% (2)
Community agencies/facilities	**50% (8)**
Community center	32% (5)
Library	25% (4)
Government agencies	**38% (6)**
Local government agency	32% (5)
Other government agency	19% (3)
Zoo or aquarium	**19% (3)**
Other	**13% (2)**

Education

All centers were involved in education (see Table 7). A Master's level degree was the most commonly offered degree through a center (MPhil/MSc, 50%, n = 8). Degrees affiliated with centers also included doctoral (PhD/ScD, 25%, n = 4) and undergraduate (13%, n = 2) HAI degrees. Four (25%) centers offered certificate programs.

Of the six centers that had degree-granting programs affiliated with HAI, five listed the associated coursework they offered. All five offered courses that included "Human-Animal Interaction" or "Human-Animal Bond" in the title, and two offered courses that included "Animal Welfare" in the title. All six degree-granting programs had courses open to graduate students, four offered a course at the undergraduate level, three to veterinary students, and one offered continuing education coursework. Centers reported that their courses were offered every semester (n = 2), every year (n = 5), and every other year (n = 1).

Students affiliated with centers included Doctor of Veterinary Medicine (DVM/Veterinary; 50%, n = 8), doctorate of philosophy or science (PhD/ScD; 44%, n = 7), master of science or philosophy (MSc/MPhil; 63%, n = 10), and undergraduate students (75%, n = 12; see Table 7). The number of DVM/veterinary students ranged from 0 – 25 (*M* = 1.94, *SD* = 6.19). The number of doctoral students ranged from 0 – 4 (*M* = .88, *SD* = 1.26), while Master's students ranged from 0 – 50 (*M* = 6.56, *SD* = 16.02). The total number of undergraduates during a typical semester ranged from 0 – 26 (*M* = 7.0, *SD* = 8.29).

Discussion

The 2016 Centers for Human-Animal Bond survey collected data on 16 academic centers and institutes in the United States. Data provided insight in their demographics, research, engagement, and education related to HAI.

Demographics

The steady expansion in HAI-focused centers and programs has continued since the first Rowan et al. study was published in 2008. The age of centers

Table 7. Education – Human-animal interaction (HAI) opportunities

			Degrees			Courses		
Year Founded	University	Center	Doctoral	Masters	Bachelors	Campus Course	Online Course	Certificate Program
1977	University of Pennsylvania	CIAS						
1981	University of Minnesota	CENSHARE						
1982	Purdue University	CHAB	X	X		X		
1984	University of California, Davis	CAS	X	X	X	X		
1986	University of Tennessee	HABIT		X		X		
1997	Tuskegee University	CSHAIR						
2001	Virginia Commonwealth University	CHAI				X		
2005	University of Denver	IHAC		X		X	X	X
2005	University of Missouri	ReCHAI				X		
2007	Virginia Tech	CENTAUR	X	X				
2011	Canisius College	AMP		X	X	X	X	
2012	University of Pennsylvania	PVWDC						X
2013	Oakland University	OCHAI						X
2014	University of Arizona	HAIRI				X		
2015	Tufts University	TIHAI		X		X		
2015	Washington State University	CSAW	X	X		X	X	X

is fairly evenly distributed between three ranges: 30-40 years (31%, n = 5), 10-20 years (31%, n = 5), <10 years (38%, n = 6). However, no centers were founded between 1987 and 1997. The majority of centers established before 2008 are associated within colleges of veterinary medicine (7 out of 10). It is not surprising that veterinary communities led the way in this field as the practicing veterinarian is provided first-hand evidence of the strength of this relationship on a daily basis. More recent diversification of center affiliation is recognizable based on the survey information gathered in the fall of 2016. Four out of the six centers established since 2008 are not housed in veterinary colleges. This may reflect an increased recognition of the role of HAI in human medicine and well-being. While research in HAI has become more prevalent and sophisticated the human medical community has yet to fully appreciate the benefit of HAI towards the wellbeing of their patients. This conclusion is based upon the observation that as center affiliation has diversified since 2008, there remains only one center associated with a School of Human Medicine (established in 2001).

The 2008 report on HAI centers indicated that the main funding source was through foundations, industry, and individual donors and bequests. In general, these centers were allotted only small amounts of state and federal derived funding, and much of that funding was in the form of salary for faculty that were assigned (often part-time) to contribute to the center. Information obtained from the 2016 survey indicates that current funding continues to be mainly derived from donors and bequests, but there is some growth in the number of faculty members and support staff that are assigned to centers. As new sources of research funding become available, it is anticipated that universities' support will continue to grow.

Research

All but one of the centers reported engaging in research of some kind, which further reinforces that centers take an important role in fostering HAI scholarship. Results indicated that the majority of HAI centers conduct research focused on companion animals, particularly dogs, cats, and horses. These results reflect the reported research foci within HAI centers (and general trends in HAI research more broadly) on animal-assisted interventions and pet ownership, which typically involve companion animals such as dogs and horses. It is interesting to note that a number of centers also conducted research on animal-focused outcomes such as dog training and cognition, demonstrating how it is crucial to view HAI as a mutually-influential phenomenon. The human populations involved in HAI research ranged from children through older adults, highlighting the importance of HAI across the lifespan. Many centers reported using survey assessment tools, which are often a popular methodology in HAI research, and can be useful in obtaining large scale datasets. Many centers also reported the use of behavioral assessment techniques and physiological measures, which represents a step forward in moving beyond exclusively self-report data.

Overall, it is clear that HAI centers are highly engaged in research on a number of topics that align with the overall foci seen in the field of HAI more broadly. As the field continues to grow, future work should explore the role of HAI centers in providing the infrastructure to support larger-scale research projects by bringing together faculty, postdoctoral associates, staff, and students. Centers may be a key

factor in promoting efficiency for interdisciplinary research teams that can in turn engage in robust, long-term programs of HAI research.

Engagement

Most HAI centers reported involvement in engagement activities, with AAI programs being the main service activity delivered to the community. A volunteer-based animal-assisted intervention program is the prime example of a community service activity to showcase the human-animal bond, so it is no surprise that this is the most frequent type of engagement. AAI programs also provide opportunities for service-learning (Bringle & Hatcher, 2002), which enhances the engagement of an organization. Through AAI, students and the public learn about the human-animal bond and working with animals while providing a service to the community.

The form of communication most frequently used by HAI centers to reach the community was through a website or blog. Many used Facebook as a platform of engagement, while newsletters were less prevalent. A strong online presence is a powerful tool to promote an organization to the public, to facilitate active discussion, and to go "viral" in reaching larger audiences. The ease, low cost, and accessibility of using social media to effectively provide regular updates on an organization's status may be a reason why newsletters may be less utilized. The method of communication in social media will likely change as technology evolves (Lovejoy & Saxton, 2012). In addition, professional website designers and communication specialists may be valuable resources for centers to effectively engage the public.

Most centers regularly engaged the community through providing events centered around education with invited speakers, followed by conferences and workshops. This form of engagement effectively educates the public about HAI activities by building awareness and promoting support in the field. These events likely serve as venues of disseminating research activities and findings (Jones & Wells, 2007); while dissemination of research was not a response option provided in the survey items related to community engagement, participants did report research and press releases in the open-ended text box to describe "other" types of engagement. Research dissemination is likely to be a form of outreach in which the overwhelming majority of centers have been or continue to be involved.

Although there was a strong prevalence of engagement activities among HAI centers, one of the main challenges for these programs was acquiring funding. Only half of all the centers had received sponsorship for engagement programming, although the sources of sponsorship were not obtained for this study. Seven centers reported fundraising activities as a form of engagement, with many collaborating with other partner organizations in raising money. Interestingly, most HAI centers do not work independently; rather, they collaborate with other organizations, such as educational facilities, healthcare facilities, and other non-profit organizations. Partnering with other organizations is key in building a strong reputation within the community. Still, more opportunities for sponsorship should be made available to centers for engagement activities.

Engagement will continue to be an important aspect of HAI centers, and as the field of HAI grows and technology evolves,

different opportunities and challenges for engagement will likely present themselves in various ways.

Education

All centers offered educational opportunities, although there was much variation in the types of courses, certificates, and degrees they reported offering. Half of the educational opportunities described were affiliated with colleges of veterinary medicine, while the other half were comprised of undergraduate and graduate programs that operated independently of veterinary schools. Courses that included "Human-Animal Bond" or "Human-Animal Interaction" in their title were mentioned most commonly, although some centers named courses, such as "Animal Welfare," that focused on the animal side of the human-animal relationship. Based on data reported by the six centers that offered degree-granting programs, the number of individuals with specialized undergraduate or graduate training in HAI is growing annually. The types of courses centers offer are preparing graduates to be leaders in a variety of areas, such as animal assisted intervention, animal advocacy, and HAI research.

Limitations

Data from the survey may be limited by the sampling techniques in three key ways. First, it is possible that centers and institutes may have been missed in the identification process. Although a librarian data specialist conducted the search, any centers without a website presence or the use of standardized terminology on their website may been missed. Second, keystone activities in the field may occur through individuals who are not affiliated with centers or institutes. Their work is not captured through this survey, which is intended to highlight the broad reach and activities of critical hubs in the field through centers and institutes. Finally, the survey was limited to centers and institutes in the United States. The field of human-animal interaction has a strong international presence (e.g. O'Haire, 2017), as indicated by the reported prevalence of international collaborations between HAI centers in this survey. Thus, future studies of this nature should expand their recruitment strategy to incorporate centers and institutes around the globe.

The survey was developed to provide an overview of the growth of the field in preparation for a conference specifically designed for those in academic centers in HAI. The survey was not designed to be an exhaustive depiction of HAI in academic settings, which may also include individuals or groups conducting HAI research or teaching an HAI course in the absence of a formally recognized center or institute. Further, this was not a standardized survey as one could not be identified in the existing literature. Participants and reviewers provided feedback on the survey content and structure (e.g., suggestion to include an item regarding textbooks used in HAI courses, suggestion to include informal educational activities such as guest lectures or presentations), which will be incorporated to improve future editions of the survey.

Conclusion

Since the 2006 Purdue Centers for Human-Animal Bond Conference, the field of HAI in the United States has grown substantially. Seven new centers/institutes were developed over the past decade. The growth of the field is also exemplified by increases in research funding, engagement

programming, and educational opportunities. Though still a comparatively small field, the productivity and trajectory of centers and institutes highlight the importance and impact of the field of HAI.

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Appendix 1: Survey for HAI Centers

Overview

What is the full name of the Center?
What is the Center's department within the University?
What is the Center's college affiliation(s) within the University?
What year was the Center founded?
How many directors does the Center have?
Are any of the directors veterinarians?
- Yes
- No

How many personnel does your Center currently have in the following categories?
- Tenure track faculty
- Clinical faculty
- Visiting faculty
- Administrative assistants
- Non-student research assistant
- Veterinary/DVM students
- PhD students
- Master's students
- Paid undergraduate students in a typical semester
- Unpaid undergraduate students in a typical semester

In what ways does the Center obtain funding? Check all that apply.
- Federal funding (e.g. NIH, NSF, DoD, NASA)
- Foundation support (e.g., the Sir James Dunn Animal Welfare Centre)
- Individual donors and bequests (e.g. the Animal Medical Center)
- Industry support (e.g., animal-protection, pet-food, pet-product, breed-registration groups, assistance animal programs)
- Tuition income (e.g. Tufts)
- University/veterinary school support for faculty associated with the Center's activity
- Other (Please Describe)

Does the Center collaborate with other HAI centers?
- Yes

No

Does the Center have any international collaborators?

Yes

No

What forms of outreach does the Center use, if any? Check all that apply.

Facebook

Newsletter (print or email)

Twitter

Website/blog

Other online social network

Other

N/A - The Center does not use any forms of outreach

What types of events does the Center host on a regular basis? Check all that apply.

Conference

Invited speakers

Workshop

Other

N/A - The Center does not host any events on a regular basis

Engagement

Has the center conducted or provided non-research programs (e.g., community engagement or programming)?

Yes

No

(If yes) What kind of non-research programs has the Center conducted, provided, or engaged in? Check all that apply.

Animal-assisted activities (AAA)

Animal-assisted education or reading (e.g, reading to dogs in libraries or cats in shelters)

Animal-assisted therapy (AAT)

Physical activity (e.g. dog walking programs)

Pet/animal education (e.g. Animal Behavior Clinic)

Pet care (e.g., grooming, feeding, walking, and other pet care tasks)

Pet loss/grief counseling

Service/assistance animals

Training for animal-assisted activities or therapies (e.g., training community members to visit heath care facilities with their own dog)

Veterinary services (veterinary care for companion animals)

Other

Do you collaborate with other organizations in the implementation of the program(s)?

Yes, all of the programs

Yes, with some of the programs

No, with none of the programs

What organizations has the Center collaborated with in the implementing of these programs? Check all that apply.

- Animal rescue group
- Animal shelter/humane society
- Community center
- Health care facility (e.g. hospital)
- Library
- Local government agency
- Local school
- Other government agency
- Residential facility (e.g. nursing home)
- Student club/organization
- Volunteer organization (e.g. United Way)
- Zoo or aquarium
- Other

Does the Center have sponsorship for engagement programming?

- Yes
- No

Has the Center ever used any of these programs for fundraising? Check all that apply.

- Yes, for our Center
- Yes, for partner organizations
- Yes, for other organizations
- Other
- No

How many years has the longest running program been running for?

Research

What types of animals does the Center conduct research with? Check all that apply.

- Agricultural
- Companion
- Laboratory
- Urban
- Wild
- Zoo
- Other
- N/A - None of the above

What types of companion animals does the Center conduct research with? Check all that apply.

- Birds
- Cats
- Dogs
- Fish
- Horses
- Small mammals (rabbits, ferrets, guinea pigs)

Small reptiles (geckos, snakes, tortoises)
Other
N/A - None of the above

What areas of human-animal interaction research does the Center conduct? Check all that apply.

Animal-assisted activities (AAA) - provide opportunities for motivation, education, or recreation to enhance quality of life.
Animal-assisted education (e.g. goal-oriented educational programming)
Animal-assisted therapy (AAT) - goal directed intervention in which an animal is meeting specific criteria as an integral part of the treatment process.
Animal welfare
Companion animal ownership
Emotional support animals
Instrument development (for HAI)
Pet care (e.g., grooming, feeding, walking, and other pet care tasks)
Pet loss/grief counseling
Quantifying the human-animal bond
Reading (not goal oriented, e.g. reading to dogs in libraries or in shelters)
Service/assistance animals
Other
N/A - None of the above

What ages of people does the Center conduct research with? Check all that apply.

Infancy (0-1)
Toddler (1-2)
Early childhood (2-5)
Middle childhood (6-11)
Early adolescence (12-18)
Late adolescence (19-21)
Adulthood (22-40)
Middle age/middle aged persons (41-60)
Older adults (61+)

What specific populations and/or disorders does the Center conduct research with or about? Check all that apply.

Alzheimer's disease or dementia
Ambulatory disabilities (physical/permanent disabilities that affect mobility)
Anxiety disorders
Attention deficit hyperactivity disorder (ADHD)
Autism spectrum disorder (ASD)
Bind /vision impaired
Bipolar disorder
Cancer
College students
Deaf /hearing impaired
Depression
Diabetes

Domestic violence victims
Externalizing disorders (e.g. conduct disorder, oppositional defiant disorder)
Learning disabilities
Post-traumatic stress disorder (PTSD)
Seizure disorder/epilepsy
Substance abuse
Traumatic brain injury (TBI)
Typically- developing children
Typically-developing adults
Veterinary students
Other

What research methods has the Center used? Check all that apply.

Animal stress hormone physiology (e.g. cortisol)
Behavior - animal (live or video-coded)
Behavior - human (live or video-coded)
Blood pressure
Epidemiological methods (e.g. database analysis)
Experience sampling/ daily diaries
Electrodermal activity (EDA), skin conductance, galvanic skin response (GSR)
Heart rate, heart rate variability (HRV)
Human stress hormone physiology (e.g. cortisol)
Oxytocin (either human or animal)
Survey (standardized measures)
Survey (non-standardized measures)
Qualitative (interviews, content analysis)
Other

Has the Center developed a methodological tool?

Yes -Please name or describe the tool
No

Education

Does the Center offer any certificates?

Yes
No

(If yes) Please list the official name(s) of the certificates offered

What type, if any, of Human-Animal Interaction degrees are offered through the Center or University? Check all that apply

Undergraduate
Masters (e.g. MSc, MPhil)
Doctorate (e.g. PhD, ScD)
No degrees are offered

Please list the official name(s) of the degrees offered and their level (e.g. PhD, MSc) Format: Degree; Level For example: Human-Animal Interaction; MSc, PhD

Does the Center or University provide courses that teach about human-animal interaction?

- No
- Yes- Electives
- Yes- Required

Please list the official name(s) of the courses offered and the department that they are offered by Format: Name; Department; Course Code Example: Seminar in Animal Welfare and Human-Animal Interaction; Comparative Pathobiology; CPB 4800.

You may also add a link to the course if applicable.

What populations can take these courses? Check all that apply.

- Undergraduates
- Graduates
- Veterinary students
- Continuing education
- Other

Are any of these courses offered online?

- Yes
- No

How frequently are these courses offered? Check all that apply.

- Every semester
- Every year
- Every other year
- Other