Etología, 1:9-17 (1989)

Horse play as an ethosystem

A.F. Fraser

Fac. of Medicine, Health Sciences Centre, Memorial Univ. of Newfoundland, St. John's, Newfoundland, Canada, A1B 3V6

ABSTRACT. *Horse play as an ethosystem*.- Forms of specific equine play can be seen as games in which behavioural laws (or rules) are employed. A great variety of play is the proyection into behaviour of a motivating force concerning action. The capability of the individual horse, as a mobile and social unit, depends on the developments which play facilitates. Horse play serves as a potentially useful model with which to compare analogous forms of play in other species. The resemblances with play in others are striking and could even provide material for appraising human play as an ethosystem which still functions.

KEY WORDS. Equine play, System of kinetic organization

Introduction

Among foals, play appears to be important in the development of early social organization, but play is also important as a form of physical exercise. Play functions as a means of practising and perfecting adult behavioural skills necessary for defence and for certain types of movement. Play is clearly valuable for the development of normal animal behaviour and it occurs most often in healthy young animals. Its absence may be an indicator of illness but its occurrence is common in the individual or the group. Chasing and mock fighting, are common in social play. Solitary play can take the form of running around in confined areas as a form of exercise. Mouthing and biting are shown in all foals at play.

The various play activities differ from the "serious" counterpart activities in their accompanying emotions and in the duration of action. In the "serious" situation, when an animal has fled beyond the reach of its opponent, flight ceases; again, when an animal has repelled its opponent, fight ceases. Such cessations are not observed in play, which may continue for extended periods. In all the several manifestations of play there is the single emotion of apparent pleasure, while in "serious" situations there are the specific emotions of anger, fear, etc.

The progress of kinetic development is rapid in the first few hours following the birth of the foal. The day-old foal shows bursts of sudden gambolling and leaping as spontaneous acts of locomotor play. Infant play appears to be important in the development of kinetic competence. Equine play is a good demonstration of play as a purely kinetic activity. For example, 75% of the kinetic activity of foals is in the form of play. Horse play is also a social activity and also is dependent on reaction. The interaction of several modes of activity into one major method of harmonious integration between the animal and the environment has been described as an ethosystem (being roughly analogous to an ecosystem). Play can therefore be

presented as an ethosystem of particular importance to a species which is very reactive, kinetic and social. The horse happens to be the best example of such a species.

Systems and motives concerned in play

In the new-born foal some parts of the neuro-muscular system, such as those concerned with change of posture and those concerned with walking, are adaptive. An adaptive role for some other parts of the neuro-muscular system is not so evident. These latter parts are precisely those concerned in the phenomenal activities collectively called play. Play is composed of patterned behaviours. Similar patterns are atributes of several individual members of the species. Thus they are traits which are typical of the species, not of a variety. As simulations, acts of play contrast with acts of "serious" situations (Brownlee, 1954, 1984).

Routines of non-playful movement relate to the following items: walking in search of milk, food and water; chewing and swallowing food; shifts of posture at rest; adopting the postures of defecation, urination, stretching; active movements concerned with grooming and body care; following the dam or following the herd. Since these are all contained in the normal repertoire of infant behaviour, their various forms are not required to be simulated in play. By contrast, the play movements in the young simulate those seen in such "adult" activities as fighting and fleeing.

The "serious" adult activities of fight and flight are not functional in the young animal. Since it is to be fed and protected by its dam, the juvenile normally does not require to fight nor does it require to initiate flight. Yet, although these "serious" activities are not required to be carried out by the young, the neuro-muscular requirements are already in existence and are thus included in the agenda of behaviour practice. Most of the activities in juvenile play occur as chasing, fleeing and hiding. The non-serious nature of play ensures that real injury is seldom inflicted in a play-fight and no escape is truly achieved in a play-flight.

Many behavioural factors have a related emotional component, such as: repletion in ingestion, comfort in tactility, arousal in motion. So, also, it would appear that neuro-muscular play is emotionally satisfying when this factor is activated in exercise. It would appear that animals are emotively reinforced in playing, as they play repeatedly and spontaneously. When play is denied, as in chronic confinement (even in the adult), an outburst of play activity is usually seen in these animals on being released.

Although the kinetic manifestations of play simulate those seen in the "serious" activities of fight and avoidance, the evident emotions in these various activities differ between the "serious" situation and play. In serious fight there is anger and in serious flight there is fear. In play there is only one evident emotion common to all the kinetic manifestations which are coupled with reactivity. Thus there are playful vocal expressions in play; foals may squeal in play.

Some learning is required in play (Fagen, 1981). Although play movements are basically innate and patterned, they are not perfectly performed on the first occasion of their expression. Proficiency in play is attained remarkably quickly after animals learn the attributes of its associates and its environment.

Benefits of play

The opinion has been expressed by Brownlee (1984) that although the main goal of play is obtaining the physiological benefits that arise from the activity of the organs concerned, physiological benefit is not the immediate goal. In play the primary goal is consummatory; benefits ensue as a consequence.

Intra-specific contact is only the initiation of the play process for play continues beyond initiating contact. During the extended play periods, the secondary physiological benefits continue to accrue.

Increased knowledge of the attributes of the animate and inanimate environment are secondary benefits which also accrue. These secondary benefits show that play has mixed goals and roles.

Vascularization is markedly influenced by the activities of play. With the onset of post-partum life, a new situation arises regarding vascularity. Each system of the body is liable to make its own demands on an essentially limited blood supply. This supply is influenced by the activity of the organ concerned. Without the existence of play the neuro-muscular systems would be denied optimum activity with consequent failure to obtain optimal blood supply. That the role of play is physiological is apparent when conservation of energy is needed for physiological homeostasis. Again, in low planes of nutrition the haemodynamic needs of vital organs cause the tendency of play to be reduced, for conservation.

When play muscles are deprived of optimal blood flow, e.g. by the absence of play activity during prolonged confinement, there is usually an outburst of such activity on release of the affected animal. This can be presumed to indicate a tension in play motivation and play tension may relate physiologically to muscle needs for periodically increased vascularization. The supplemental nutrition of muscles, through active hyperemia resulting from play, is a physiological process in keeping with the overall roles of play in creating, temporarily, a generalized hyperemia.

Development of play

Among foal groups social play usually increases with age while solitary play declines. The latter is reduced to a very low order of activity by two months of age. Solitary play persists, however, in lone foals and their social play may relate to other species of animals and humans. Foals may also play with inanimate objects (Tyler, 1972; Schoen et al., 1976).

In addition to grooming with their dams, foals in groups also groom one another. Grooming bouts often initiate play and oral snapping actions are often seen in foals when they are initiating play. The commonest form of play between foals involves nipping of the head and mane, gripping of the crest, rearing up towards one another, chasing, mounting and side-by-side fighting. There are sex differences in foal play, with colts mounting more frequently and engaging generally in play more vigorously than fillies. Play in foals tends to be more frequent in males than females. The response of fillies to colt play is often withdrawal or aggression. Most play involves nipping or biting various parts of the body, but running about alone or in groups, and chasing with much head tossing, sudden stops and starts, and kicking of the hind legs in the air are also typical.

Play is frequentely mixed with exploratory and investigatory behaviour. Play activities, either around the mother or alone, diminishes with age. Bouts of play are a notable feature and foals initiate play bouts with each other more frequentely as they mature and leave the mare. Play around the mother is reduced markedly between the first week and the fourth week of life. Foals three and four weeks of age often have play bouts lasting ten to fifteen minutes. Such bouts are usually initiated by one foal, developing the bout from a mutual grooming episode by changes to acts of nipping. A bout may be ended mutually by the two foals separating or, more often, by one foal which are of similar age, but occasionally they play with foals differing in age by two to three months.

Solo gambols and capers are shown in the first days. Interactive play with other foals may take the form of chasing and reverse chasing and may include body contact in the form of pushing, bitting, neck-wrestling, mutual rearing. This form of play is especially frequent in group-living and may merge into low-intensity agonistic fighting. Social interactions involve fighting. This may determine position or rank in animals just entering subadult society (Fagen, 1981).

In juvenile play the same locomotor or manipulative behaviour is often repeated with slight variation, at a given stage of mastery. Such behaviour includes jumping vertically, running away from the mother and back to her, and various repetitive manipulations of objects. Such behaviour

of "mastery" merges into another category of play behaviour called diversive play or diversive exploration. These vigorous interactions with an inanimate object follow initial sensory inspection.

General features

The horse shares similar characteristics of play with other ungulates. The foal, like the lamb or calf may run round, leap vertically in the air again and again, gambolling and capering, twisting its body and kicking out with its hind feet. Such play is distinguised from flight from a predator, from captivity by its non-threatening context, by the loose body tone, and by the repetition. The ease of interruption of this activity also is a characteristic of play. Contact with inanimate items is another feature of play. Objects such as plants, or parts of plants may be tossed, shaken, pawed, pushed, or jumped over, repeatedly.

No matter what function of play is at issue, the interests of any two individuals in play will rarely coincide. Conflicts over social play may arise when potential partners disagree about the time or place at which play occurs. Two animals of the same age, size and sex may both benefit from moderate-intensity fighting but if one animal has just fed or has not played for a long time, and the other is about to feed or has just played, then the second may resist the play solicitations of the first. Again, mothers may intervene in the play of their offspring and each individual will prefer to play at a closer distance to its own mother than to its playmate's mother. Any social play interaction necessarily involves a compromise between partners. This need to compromise makes play a challenge to social cooperation.

Individuals will play with partners that contribute most strongly to that individual's fitness (Wald, 1958). Preferences for play forms and play partners may not always coincide between playing partners and a certain amount of conflict over play results occasionally.

Social play at its cooperative best is a remarkable phenomenon. Evenly matched and closely related partners cooperate in apparent mutual physical and skill development. This play is non-injurious and does not harm social relationships. It may strengthen long-term prospects for cooperation of individuals remaining as one group. Even when an older animal plays cooperatively with a young one, special communicative signals and stabilizing techniques ensure that play is fair to both participants.

Social play reflects biological adaptation. Like other aspects of social behaviour, it has been selected to adjust to a broad range of environmental conditions in the service of fitness. Because of this inclusiveness it is clear that play is neither essentially cooperative nor necessarily competitive (Dobao et al., 1985).

Biological objectives

A great variety of meaningful features of play are pointed out by Fagen. This recent and definitive publication, on play as a general biological phenomenon, indicates the great scope for a fuller recognition of this category of behaviour as a vital force in maintaining development and self-determination.

Play is costly behaviour; it seems aimless, capricious, and inconsequential and its sequences include behavioural acts or sequences of behaviour also occurring in high-risk adult activities, but the products of these high-risk activities are absent from play. The risk of death by predation is not avoided as a consequence of play, conflict over a contested resource external to play is not settled and a zygote is not produced. Because play is so risky and requires so much time and energy, the question arises about beneficial effects which may result from play that

might compensate for its apparent cost to the play animal.

There are, of course, great biological objectives for the playing animal, both immediately and ultimately. Fagen outlines six of these as follows: 1) Development of physical strength, endurance and skill; particularly in those acts or combinations of acts used in social interactions having potentially lethal consequences. 2) Promotion and regulation of developmental rates. 3) Experience yielding specific information 4) Development of cognitive skills necessary for behavioural adaptability, flexibility, inventiveness, or versatility. 5) Acquiring beha- vioural tacticts used in intraspecific competition. 6) Estabilishing or strengthening social bonds in a pair or the social cohesion in a group.

The main general objective of play is in behavioural development and Fagen alludes to this also. The evolutionary significance of the development of behaviour is that, for a number of reasons, young animals exhibiting behavioural development survived and reproduced better, as compared with other young whose behaviour changed less fundamentally with development. Developmental behaviour can therefore be viewed as reflecting adaptation. Such adaptation includes one or more components. A number of component skills include reactive, tactile and social ones, the development of each of which can begin in play and be followed through the whole life of the animal in many situations. Each component skill is characterized by its own rate of development and by its particular susceptibility to environmental influence during the lifetime of an individual. In addition, the mixture of "fight anf flight" might be seen as release of strain or stress (Yousef, 1988).

Laws of play

Numerous charecteristic features of play have been reported by Fagen. The 12 features which most exemplify the laws of horse play are itemised below: 1) The animal that is ready to play appears to have a play appetite by looking for an opportunity to play. 2) Inhibitions control play, particularly the avoidance of injuring the partner. 3) Use of inanimate objects, or individuals of other species as substitute playmates, indicates lack of stimulus specificity. 4) An episode of play, or the "play bout", is typically preceded by a signal which indicates "what follows is play". These signals may recur during the bout to keep it continuing. 5) The individual movements making up the sequence may become more exaggerated, showing a build up in motivation as the play bout continues. 6) Transmission of playing mood to other individuals, particularly to playmates, shows relationship to "group effect" or social facilitation. Social play is characterized by the exaggerated and uneconomical quality of the motor patterns involved. This is most pronounced under the effects of social facilitation. 7) Experimental play, sometimes leading to new nervous and muscular coordinations, shows the variability in play; the same behaviour directed at different stimuli shows the variable adoption of convenient stimuli. 8) The general course of play may involve exaggerated or uneconomical motility and may be relatively unordered in sequence from one time to another. 9) Sort sequences and repetitious motor patterns are characteristic of small play units. Certain movements within the sequence may be repeated more often than they would usually be in "serious" situations. Actions repeated and performed in an exaggerated manner are very characteristic. 10) Animals repeatedly returning to the stimulus source indicate that play has direction; it lacks a consummatory act as an end point, however. 11) Play occurs in a relaxed motivational setting when it is not displaced by essential maintenance. The activity appears "pleasurable" to the participants by subjecitve deduction. Play stops when a stronger stimulus or unpleasant event intervenes. 12) Individual movements within the sequence may never be completed and this incomplete element may be repeated many times, indicating that behavioural units in play are not essentially linked as a chain.

This very substantial body of ethological laws relating to play behaviour indicates that this

category of activity is of such vital importance to animal life that its structuring is detailed to ensure its objectives. It is clear that play is central to behavioural epigenesis, both as a set of epigenetic rules and as a mechanism for modifying these rules in response to individual play experiences. The phenomenon of play could become a basic factor in the determination of conditions of welfare, particularly as it relates to the normal development of the animal.

Equine games

Forms of specific equine play can be seen as games in which the above laws (or rules) are employed. Chief among these are the following: 1) "Foal Play", 2) "Nip and Shove", 3) "Chase and Charge", 4)"Dynamic Duo". Features of these four games (table I) are as follows: 1) Foal play.- Soon after birth foals begin to kick, jump, hop and run in playful manner, as foal gambolling. They do this alone. When they have acquired adequate equilibrium their playful activities extend to the mother. Such actions are typified by nudging and nipping. At a more advanced stage in the development of foals they play with each other; the "game of foals" involves competitive exchanges portrayed in pushing each other and running together. 2) Nip and Shove.- In this game, seen in both young and mature horses, two or more animals apparently compete for temporary mastery. They nip one another, biting around the head, neck and forequarters of the competitor. The individual presses its weight down or the against competitor forcing it to move. Mock fighting is the essence of this game (fig. 1). 3) Chase and Charge.- In this game, which is again seen both in young and in mature animals, there is essentially a group activity. Several animals may chase each other. This quickly leads to running in a group. The running has specific direction and, as a result, the game has the appearance of a charge. 4) Dynamic Duo.- Pairs become formed as a result of a series of

TABLE I. Forms of horse play.
[Formas de juego en caballo.]

General Form	Characteristiques	Outcomes
1) Foal Play	(a) Neonate: Jumping, kicking, hopping, running, nipping, nudging.	(a) Equilibrium. Ambulatory competent.
	(b) Juvenile: Pushing, running, wirh competitor, competitive exchanges.	(b) Social development.
2) Nip and Shove	Nipping and biting around head and neck. Presing body weight on or against associate.	Agresive skills. Social dominance.
3) Chase and Charge	Group running with specific direction.	Collective experience. Group cohesion.
4) Dynamic Duo	Playful exchanges. Maintenance of association and proximity.	Strong pair-bond formation. Allied social arrangement.

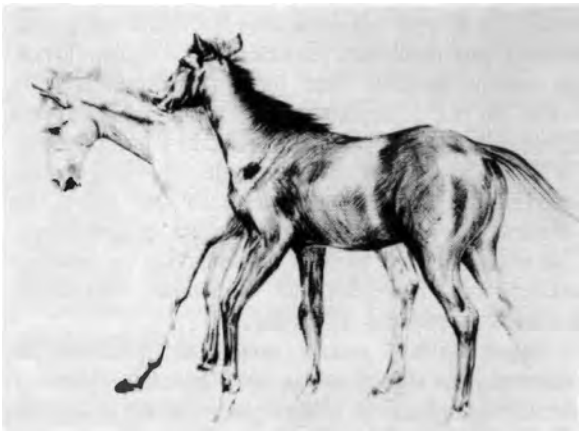

FIGURE 1. The "Nip and Shove" game in operation with two young colts.

[Juego del "Mordisqueo y Carga" en ejecución por parte de dos potros jóvenes.]

playful episodes and exchanges by two individuals. When the playful partnership has become established a close bond is formed between the two. This binds them together in all circumstances. Even when the pair becomes part of a larger group the two-some arrangement operates dynamically in their interests by the mutually defensive and protective features of the pair bond.

Discussion

The complex functions in the play of this highly kinetic species reveal an ethosystem. Use is made of the latter term as meaning a compound system of behaviour, relating to the physical and social integrations of individuals. Play is also seen as a substrate to the vital and "serious" capabilities of individuals, particularly in adult life. Mock fighting is a notable component of juvenile play in the horse. Under natural conditions it is only the stallion which is competent in fighting which becomes a breeder. Play is thus seen to have a selective role.

Horse play serves as a potentially useful model with which to compare analogous forms of play in other species. The resemblances with play in others are striking and could even provide material for appraising human play as an ethosystem which still functions. The earlier notion that aggressive contests among animals are not intended to be harmful is probably only tenable now in the context of the play ethosystem, for "serious" aggression has harmful intent and consequence.

In domestication the kinetic ethos of the horse has been diverted into forms of work and recreational activities. The modern horse probably adopts these as analogues to natural play which, incidentally, ensure the integration of the animal (and its welfare) under domestication. For example, running and chasing relate to racing; grouped movement may relate to team work in harness; natural kinetic output may relate to the various forms of riding. Horse play also facilitates pair bonds. This latter capacity is remarkable in the horse. Human bonding may be the secrete of success in the way this animal has dealt competently with domestication while preserving its behavioural characteristics, such as reactiveness, more suitable to prehistory. It may be that such adult bonding is an outcome of play skill in the horse. This again would allude to the survival value in play, this behavioural phenomenon which is at once both frivolous action and vital experience.

Conclusion

It can be concluded that horse play is the projection into behaviour of a motivating force concerning action. The capability of the individual horse, as a mobile and social unit, depends on the developments which play facilitates. As pointed out by Waring (1983) play behaviour has a major role in the behavioural, social

and physiological development of all horses. Put simply, horse play makes the horse.

Resumen

El juego en el caballo como etosistema.

Entre los potros, el juego parece tener importancia en el desarrollo temprano de la organización social, aunque también es importante como forma de ejercicio físico. El juego sirve de medio de práctica y perfeccionamiento de las habilidades comportamentales del adulto. Asímismo, el juego tiene un claro valor en el desarrollo de la conducta animal normal y se da con mayor frecuencia en animales jóvenes sanos. Su carencia puede resultar indicativa de enfermedad, pero su incidencia es corriente tanto en el individuo como en el grupo.

Brownlee (1984) ha expresado la opinión de que aunque el objetivo fundamental del juego es la consecución de beneficios fisiológicos derivados de la actividad de los órganos implicados, el beneficio fisiológico no es el objetivo inmediato. El objetivo fundamental del juego es el contacto consumatorio con entes complementarios del entorno; los beneficios fisiológicos surgen como resultado del mismo. La vascularización depende en gran medida de las actividades lúdicas. Con el comienzo de la vida postnatal, surge una nueva situación en lo tocante a la vascularización. Cada sistema corporal va a plantear sus propias exigencias a un suministro sanguíneo básicamente limitado. Dicho suministro depende de la actividad del órgano en cuestión. Sin el juego, los sistemas neuromusculares se verían privados de una actividad óptima, con la consiguiente imposibilidad de obtener un aporte sanguíneo óptimo. El que el juego desempeñe un papel fisiológico resulta obvio al considerar que no se da en tiempo frío, cuando se precisa reservar energía para la homeostasis fisiológica. Asímismo, cuando los niveles de nutrición son bajos, las necesidades hemodinámicas de los órganos vitales tienden a reducir el juego en favor de la conservación.

El caballo presenta características de juego parecidas a las de otros ungulados. El potro, como el cordero o ternero, corretea, efectúa saltos verticales, brinca y hace cabriolas, retorciéndose y coceando con los cuartos traseros. Este juego se diferencia de la huida de un depredador en su contexto no amenazador, el tono corporal relajado y la repetición. La facilidad con que se puede interrumpir esta actividad es también característica del juego. El contacto con seres inanimados es otra característica. Los objetos como plantas o partes de las mismas pueden ser repetidamente lanzados, sacudidos, pateados, empujados o saltados.

Fagen (1981) señala una gran variedad de características significativas del juego. Su reciente y definitiva publicación sobre el juego como fenómeno biológico general indica el amplio campo de beneficios que se ofrece al animal que juega, tanto a corto como a largo plazo. Fagen enumera seis de dichas características: 1) Desarrollo de fuerza física, resistencia y destreza, sobre todo en aquellos actos o combinaciones de los mismos que intervienen en las interacciones sociales con consecuencias potencialmente mortales. 2) Promoción y regulación de las tasas de desarrollo. 3) Experiencia que proporciona información específica. 4) Desarrollo de destrezas cognitivas necesarias para la adaptabilidad, flexibilidad, inventiva o versatilidad del comportamiento. 5) Adquisición de tácticas comportamentales útiles en la competencia intraespecífica. 6) Establecimiento o fortalecimiento de los vínculos sociales de la pareja o de la cohesión social en un grupo.

El objetivo general fundamental del juego reside en el desarrollo comportamental, al que Fagen alude. La importancia evolutiva del desarrollo de la conducta estriba en que, por muchas razones, los animales jóvenes que mostraron desarrollo compor- tamental sobrevivieron y se reprodujeron mejor que otros jóvenes cuya conducta cambió de modo menos radical con el desarrollo. La conducta del desarrollo puede por tanto considerarse como reflejo de la adaptación, adaptación que consta de uno o más componentes. Algunos componentes de destreza son de naturaleza reactiva, táctil o social,

y su desarrollo puede comenzar con el juego y continuar a lo largo de la vida del animal en muchas situaciones. Cada componente de destreza se caracteriza por su peculiar tasa de desarrollo y por su particular susceptibilidad a la influencia medioambiental durante la vida del individuo

Podemos concluir que el juego en el caballo es la proyección en la conducta de una fuerza motivadora que implica acción. La capacidad de cada caballo como unidad móvil y social depende de los procesos de desarrollo que el juego facilita. Como señala Waring (1983), la conducta lúdica desempeña un papel importante en el desarrollo comportamental, social y fisiológico de todos los caballos. En pocas palabras, el juego hace al caballo.

References

Brownlee, A., 1954. Play in domestic cattle in Britain: an analysis of its nature. *Br. Vet. J.*, 110 : 48- 68.

Brownlee, A., 1984. Animal play. *Appl. Anim. Behav. Sci.*, 12(4):307-312.

Dobao, M.T., Rodriganez, J. & Silio, L., 1985. Choice of companions in social play in piglets. *Appl. Anim. Behav. Sci.*, 13:259-266.

Fagen, R., 1981. *Animal Play Behaviour*. Oxford: University Press.

Schoen, A.M.S., Banks, E.M. & Curtis, S.E., 1976. Behavior of young Shetland and Welsh ponies (*Equus caballus*). *Biol. Behav.*, 1: 192 -216.

Tyler, S.J., 1972. The behaviour and social organization of the New Forest ponies. *Anim. Behav. Monogr.*, 5:87-196.

Wald, G., 1958. *Introduction to the fitness of the environment.* (L.J. Henderson ed.). Boston: Beacon Press.

Waring, G.H., 1983. *Horse Behaviour*. Park Ridge, N. J.: Noyes Publications.

Yousef, M.K., 1988. Animal stress and strain. *Appl. Anim. Behav. Sci.*, 20:119:126.

(Recibido: 19 julio 1988)