

Role of social disorder-related environmental cues as signals in modulating social learning, norm non-compliance and collective decisions in human societies

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Observational learning and social norms are important in the functioning of human societies. This article attempts to understand human behavioural response to disorder-related cues such as litter, graffiti, etc. by integrating information from disparate areas, including group behaviour, communication, social norms and behavioural imitation. Signals obtained from disorder-related cues and social learning appear to be involved in modulating human behavioural response to observed social norms in a society. It is suggested here that signals indicating orderly and appropriate behaviours may stimulate the same in observers, gradually resulting in the spread of orderly behaviour and compliance of rules in general, in a society.

Keywords: Behavioural imitation, collective human behaviour, cultural evolution, social signals, social information collection.

SOCIAL evolutionary dynamics involving the fine-tuning of the adaptive responses of individual members in a group of social animals (a flock of birds, a school of fish, honey bees, ants, etc.) and their collective group behaviour is found to be influenced by a complex set of factors¹. These include the individual state of an organism, social interactions, environmental modifications, informational amplification and decay from the environment¹. In the functioning of the highly structured human societies² (on the basis of associations that humans have with various groups or sets), social norms (in a given social setting, individuals usually act in a certain way and are often punished when seen not to be acting in this way) play an important role³. Social norms are regarded as standards of behaviour which are based on widely shared beliefs about the expected behaviour of group members in a given situation⁴. Norms provide a guideline regarding the appropriate behaviour in a particular situation and vary depending on the nature of the group (family group, peers, business associates, etc.). Norms are suggested to enforce cooperation⁴. Whereas descriptive norms refer to what is commonly done, injunctive norms refer to what is commonly approved and disapproved⁵.

According to the appropriateness framework model, decision-making in human beings is influenced by the

identity of an individual, situational cues and the application of rules in guiding a behavioural choice⁶. Further, in structured populations human beings are suggested to learn from each other and adjust their strategies routinely^{2,7}. 'Social proof' is an important psychological principle derived on the basis of what people around us consider as correct behaviour. Cialdini⁸ argued that a behaviour is regarded as more correct in a situation depending on the degree an individual perceives others performing it. The social proof principle particularly plays an important role for decision-making in individuals belonging to a particular group or set.

Human beings are basically social in nature and obtain current information about their social organization (family, community, etc.) from diverse sources. Communication and spread of ideas and behaviour in human populations generally occur via the medium of words (vocal or written). However, sounds not involved with communicating words as well as non-verbal signals (including facial expressions, gestures, body postures and others) may also serve to communicate information. Further, observational or social learning (influence resulting from rational processing of information gained by observing others) in human beings occurs in a number of ways⁹. According to the social learning theory, people can learn new information and behaviours by observing other people¹⁰. Observational learning can be through a live model, or even through a symbolic model (for instance, characters displaying behaviours in books, films or television

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programmes). Recent studies implicate the role of human-generated signs of disorder such as graffiti, wrongly parked bicycles and firecrackers in influencing human behaviour¹¹. Observation of one type of disorder (litter/graffiti) induced another type of disorder (such as stealing) in the individuals.

It is crucial to understand the evolutionary basis of human behavioural response to such human-generated cues which foster similar disorder-causing behaviour in observers since it has policy-making implications for the maintenance of law and order. This is imperative since the recent economic crisis reveals that human beings while exhibiting rational behaviour under normal circumstances, exhibit unexpected behaviour under extreme situations. Whereas financial theories and mathematical models proved to be unsatisfactory in predicting human behaviour, new theories based on evolutionary biology and neuroscience are providing better insights¹².

Impact of social disorder-related environmental cues on the spread of disorder

According to the broken windows theory suggested by Wilson and Kelling¹³, signs of social disorder such as litter, broken windows and graffiti induce a variety of disorders and petty crimes. Their study implied that signs of physical decay in a neighbourhood indicated a decline in informal social control. Further evidence of a correlation between robbery rates in neighbourhoods with measures of social disorder was provided by Skogan¹⁴. More recent studies provide compelling evidence that disorders such as wrongly parked vehicles, graffiti and petty crimes induce further disorders¹¹. Here people responded to visual cues such as graffiti and acoustic cues such as the sound of firecrackers by further engaging in disorder-related behaviours. The number of people spreading litter and stealing more than doubled just by the occurrence of graffiti. The study suggests that external signs of inappropriate behaviours have negative effect on the tendency of people to conform to other norms and rules.

Litter and similar commonly observed human-generated environmental disorders probably serve as visual, acoustic or even chemical signals. It is plausible that signs of disorders in the environment, including betel nut spit stains (in places where people chew betel nuts and do not make efforts to avoid spitting in public places), scattered garbage, loud music blaring from loudspeakers in public places, wrongly parked vehicles, not forming or alternately breaking a queue, etc., also send similar signals. Such signals apparently communicate the violation of social norms by the members of the society. A number of interesting questions arise. How do humans collect information about group members in situations of limited direct communication? Why do humans make decisions to further contribute to disorder or to indulge in petty

crimes on perceiving environmental cues indicating disorder (norm/rule violation)? Is it because collective decision-making based on local cues contributes to survival of social animals in general and humans being social are evolutionarily adapted accordingly? If so, is it possible to stimulate conformation to social norms and rules, in general? In this study an attempt is made to understand human behavioural response to such disorders by incorporating ideas and information from a range of disciplines, including ethology, evolutionary biology, sociology, psychology and cognitive biology. The present study considers the influence of direct information collection via visual and acoustical signals, information sharing via gossip and human-generated environmental cues and the role of learned associations on human behaviour and norm/rule(s) compliance. This study also shows that social learning through information obtained about group members via gossip, observational learning and even from human-generated environmental cues indicating (dis)order is used by human beings to adapt in a complex social environment.

Quorum response, group behaviour and decision-making behaviour

Swarm intelligence (the emergence of complex collective behaviours resulting from interactions among social insects) also underlies information-sharing (such as through the internet) in human societies and may be utilized in solving business problems¹⁵. Quorum responses¹⁶ (where the probability of animals exhibiting a particular behaviour is an increasing function of the number of conspecifics already performing this behaviour) play a significant role in collective decision-making as during aggregation and cohesion^{17,18}. Group behaviours in social animals such as roosting and flocking in birds, aggregations in cockroaches, formation of fish shoals, swarming and house-hunting in honey bees and ants, probably help them in avoiding predators, finding food, shelter and/or mate more efficiently¹⁹⁻²². Formation of fish shoals in Atlantic herring for instance, begins in deep water when clusters of a few individual herrings reach a certain density of fish per square metre. These individuals then clump more closely together and attract other fishes. This behaviour spreads to other fishes in a wave and next the fish shoals stretching up to 40 km head to the shallower spawning grounds, where finally the animals mate at night²³. Collective decision-making during nest-site selection in ants and honey bees is known to be influenced by a multitude of visual, acoustic and chemical cues, and signals from the group members and the environment^{19,20}. Self-organized decisions may occur in a group regarding the direction of movement and the local rules. Collective decisions and emergence of patterns in social insects such as ants are suggested to arise as a result of competition

between different sources of information, which are then amplified through different types of positive feedbacks^{24,25}. Since survival of group members may depend on the degree of collective adoption of local rules, it is argued that such collective decisions provide cues about the evolution of sociality²⁶.

Social information collection and sharing

Gossip (auditory communication)

Among human beings gossip is considered as a medium for procuring information about others, which can provide guidance for leading one's life through comparison with others²⁷. It has been demonstrated that the degree of common fate shared by the members of a group influences the degree to which gossip is used as an instrument of social control²⁸. Studies are found to support the role of gossip in the enforcement of group norms, particularly in small-scale societies²⁹. Gossip is not only useful in the transmission of social information, but also compensates for low level of direct observation³⁰ and therefore serves for transfer of abundant information.

Non-verbal communication (visual communication)

The significance of non-verbal communication in animal and human societies has been extensively documented. Language undoubtedly is important in human communication and interactions, but visual signals also contribute subtle information. In *The Expression of the Emotions in Man and Animals*, Darwin³¹ has put forward 'the principle of serviceable associated habits' to explain the evolution of emotion expressions, including facial expressions such as the baring of teeth while sneering in rage during aggression. He argued that many such behaviours have originated from adaptive evolved processes and were functional and had survival value earlier during the evolutionary history of a species. For instance, in a species that used biting during aggression, baring the teeth was an essential behaviour exhibited prior to an attack. To explain the persistence of such facial expressions even though humans no longer bite during aggression, evolutionary biologists suggest that selection favoured reactors who were able to anticipate the future reactions of actors by responding to slight movements (such as baring of the teeth before biting). Such visual signals predicted the occurrence of an important action (such as biting behaviour) as a subsequent second step of an aggressive attack. Since during the course of their evolutionary history many such behaviours have acquired communicative value, this hypothesis may be extended to understanding communicative significance of other non-verbal behaviours, including gestures³²⁻³⁵. These visual cues probably serve

to provide information about an individual's immediate behavioural intentions.

Effect of imitation and interconnected social network

Observational learning is evolutionarily adaptive. In a human society, members can belong to many sets². Not only are more members attracted to successful sets, but also successful strategies used by individuals within a set are imitated by more individuals. Since individuals who belong to the same set presumably face similar problems, they may have the option of similar alternative strategies and pay-offs. It would be therefore, less costly in terms of time, effort and energy to imitate a successful strategy.

Behavioural mimicry is found to affect human social behaviour³⁶. It is therefore plausible to consider the imitation of disorder-causing behaviour in a local community of people as an outcome of the interactions of ecological and evolutionary processes. Here individuals are presumably using human-generated environmental cues to imitate a behavioural disorder in a similar or related manner. Further evidence of behavioural imitation emerges from real-life social networks which are demonstrated to influence smoking, health, etc. Examination of interconnected social network over a period of three decades has revealed that a person's chance of developing obesity increased if he/she had an obese sibling, spouse or friend³⁷.

Social learning (i.e. learning through observation or interaction with other individuals) via gossip or even through the internet, is therefore of undoubted importance in human beings. This has been recently demonstrated even in non-social animals³⁸.

Association between environmental cues and prior experience

Learned associations between different colours and experiences involving activation of alternative motivations are suggested to mediate the influence of colours on cognitive performances. A study on the effect of colours on cognitive task performances hypothesized that red should activate avoidance motivation, whereas blue should activate approach motivation in human subjects³⁹. Red is usually associated with danger or errors (corrections in written matter are usually made in red). In contrast, blue is associated with open places such as the sky and a feeling of peace. The study demonstrated that red led to superior performances of detail-oriented tasks (such as proof-reading work), whereas blue enhanced performances of creative tasks, as predicted³⁹. This study while providing information on the influence of different colours on motivation, also provides an insight into human perception based on learned associations between visual signals and

prior experience and/or concepts. Do visual signals such as graffiti indicate human-created environmental disorder, perceived as a broad signal of violation of social norms in general, thus stimulating other disorderly behaviours? Perception of what group members actually do has a strong influence in compliance decisions⁴⁰. An information cascade occurs when people observe the actions of others and then make the same choice that the others have made, independently of their own private information signals⁴¹. In an organized social-learning computer tournament, the winning strategy used by a pair of graduate students was found to be based on the evolutionary games theory and almost exclusively on imitation or social learning⁴². This demonstrates that social learning contributes to the successful adaptation of group members in a complex environment and therefore to cultural evolution. However, response of human beings to spread of litter, graffiti, etc. is not just a simple imitation of identical behaviour¹¹. Observation of such easily noticeable environmental disorder-indicating cues actually leads to other disorderly behaviours such as petty crimes. It is well established that cultural evolution in human societies is powerfully influenced through language and behavioural imitation². Information transfer can be facilitated through direct observation of behavioural actions of other people in a society, through information sharing via gossip or may even be derived from environmental cues signalling the recent occurrence of such actions. The collected information in turn yields valuable information about adaptation of group members to a local environment and their behavioural strategies. However, it must be kept in mind that decision-making in social situations is also affected by a number of other factors, including personal norms, situational cues and interaction between these two components^{6,43}.

Conclusion

Human behaviour is influenced by interactions among individuals, particularly those belonging to the same set. Norm compliance in human societies is regulated by a number of mechanisms. These include direct and indirect information retrieval, quorum response within a group and social learning. Disorder-related visual and acoustic signals from group members and even from human-generated environmental cues are presumably perceived as indicators of non-compliance of social norms. Learned associations between local environmental cues such as litter and behavioural disorderliness are probably instrumental in modulating human perception and in the derivation of conclusions regarding the violation of social norms in a local community. Thus signals derived from human-generated litter, noise, graffiti, etc. mediate individual decisions through a social learning process. This may gradually affect collective behaviours of a commu-

nity through information sharing mediated via repeated interactions and/or other modes of information retrieval.

It is likely therefore that signals indicating orderly behaviours such as the sight of people standing in a queue, putting litter in assigned garbage bins and following rules in general may stimulate the same in observers and may result in the adoption of orderly behaviour. As more individuals conform to social norms and this norm-compliance behaviour is perceived through environmental cues, the norm-abiding strategy may spread in a social set. This is likely since quorum responses are shown to play an integral role in collective decisions made by social animals on the basis of cues provided by other individuals^{18,44}. Further, a variety of studies highlight the role of altruistic punishment (third-party sanctions which enforce cooperation norms even though they incur costs and reap no economic benefit from their sanctions and they have not been directly harmed by the norm violation) in norm enforcement and preventing the deviation of free riders from the group standard^{4,45,46}. Thus another aspect of discouraging the 'spread of disorders' involves altruistic punishment of the free riders. Theoretical models demonstrate that once established social norms prescribing the punishment of uncooperative behaviour are stable^{47,48}. In fact, altruistic punishment is found to be more prevalent in larger and more complex societies⁴⁹. Therefore, a possible solution to 'spread order' and norm compliance could be to initiate a tradition of environmental cleanliness/orderly behaviour and voluntary cooperation in this aspect, so that punishment of defectors can further enforce cooperation in the utilization of public goods. This may eventually stimulate orderly behaviour in local communities and cause gradual spread of the same in a larger community.

Finally, social learning and collective human behaviours may have far-reaching impact on human decision-making, much beyond simple (non) compliance to social norms. Since information cascades and herding are based on local learning and information transmission⁵⁰, collective decisions may have significant implications on the economics and politics at the regional, national and international levels in human societies.

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