Leash status of approaching dogs mediates escape modality but not flight-initiation distance in common urban bird

birds

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Communication

Leash Status of Approaching Dogs Mediates Escape Modality but Not Flight-Initiation Distance in a Common Urban Bird

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Simple Summary: Negative interactions between humans and wildlife pose a significant challenge to their coexistence. Although dog walking brings millions of people to public open spaces, roaming unleashed dogs threaten urban birds. Leashes for dogs in public parks remain controversial, with low compliance rates. As a practical solution, leashes could reduce fear among urban birds and enhance their coexistence with humans and dogs. Park leashing laws would be more likely to be enforced if there was a better understanding of how leashing laws benefit birds and wildlife. There is, however, no evidence that birds are less fearful of dogs because they understand the function of a dog's leash. Using a common urban bird in public parks in a major Australian city, we standardized human and dog approaches, both leashed and unleashed. The birds demonstrated an increased intensity of escape responses (for example, flight) when dogs were unleashed compared to leashed. By leashing dogs in parks, coexistence between people and birds would be enhanced.

Abstract: Controversy exists around owned dogs' impacts in public open spaces, with concerns about dogs' impact on wildlife, including birds. Leashing dogs in public open spaces offers a tractable way of reducing dogs' deleterious impacts on birds. Although dogs in public spaces are often unleashed, some dogs roam freely, whilst other unleashed dogs remain close to their owners. It is currently unknown whether birds can perceive and incorporate subtle differences in the leash status of approaching, but non-roaming, dogs into their escape decisions. We compare escape responses of a common urban bird, the magpie-lark *Grallina cyanoleuca*, in parks in Melbourne, Australia, to standardized approaches by a walker and a dog, which was either leashed or not leashed (but with the dog at the same distance from the walker). Flight-initiation distances, the distance between the lark and dog when escape commenced, did not vary between treatments. However, the unleashed dog evoked more intense responses (mostly flying away) than the leashed dog (mostly walking away). Thus, this species appears to perceive unleashed dogs as especially threatening, independent of their roaming behavior. Our findings suggest that leashing may be an effective way to reduce dog disturbance to wildlife, even for non-roaming dogs.

Keywords: human-wildlife conflict; interspecific interactions; social norms; bird escape response; *Grallina cyanoleuca*; *Canis familiaris*

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1. Introduction

As urbanization and human populations increase, people encounter wildlife, including birds, more frequently [1,2]. Human encounters with birds [3] are frequent in public open spaces, which provide habitat for birds as well as places where people enjoy nature and exercise [4–11]. Urban birds live in a human- and dog-rich environment and, as such,

must respond to people and their dogs (which can alter their normal states, i.e., cause disturbance) [12]. Urban birds may be less responsive to humans [13], but responses persist in urban parks [14–16].

Wildlife perceives risk in nuanced ways. Birds can distinguish between different human "stimuli" (agents capable of evoking a response) and between different attributes of the same human stimulus [3]. Examples of the former include differential responses to walkers and bicycles [17]. Examples of the latter include differential responses to joggers and walkers (i.e., different approach velocities of the same human stimulus [18]). Birds can use subtle but relevant stimulus attributes associated with humans to adjust their responses, e.g., human gaze and head orientation [19], even recognizing individual threatening humans [20]. A cognitive assessment of highly specific indicators of risk associated with different human attributes may be particularly valuable for birds where humans are common and unavoidable as well as where humans differ in the level of risk they pose. Such circumstances often occur in urban areas [20].

Dogs (*Canis familiaris*) are often the most abundant terrestrial carnivores in urban environments. Urban birds frequently encounter dogs accompanying humans in public open spaces. Dogs often elicit escape responses from birds [21,22]. The leash on a dog is a highly specific stimulus attribute that birds might conceivably use to determine the risk posed to them in such systems. Leashed dogs cannot chase birds, unlike some unleashed dogs [23]. Despite low compliance with leashing rules in many public areas [24], evidence suggests leashed dogs provoke less intense escape responses in birds [25]. It is likely that birds recognize unleashed dogs when they roam away from their owners [24]. Many unleashed dogs remain close to humans for long periods but are free to roam or chase whenever they wish [26]. Given birds demonstrated the cognitive capability to judge highly specific human characteristics, we propose that birds that encounter humans and dogs frequently may be able to judge the leash status of approaching but non-roaming humans and dogs, thereby altering their perception of risk. Any discrimination between risks likely minimizes unnecessary responses and their consequences (e.g., energy costs). Birds that inhabit the same strata as dogs, which are dependent on appropriate escape responses, should also show fine-scale discrimination. Any such discrimination is of interest from applied and evolutionary perspectives [27].

Two aspects of escape in birds reflect the intensity of their response: the flight-initiation distance (hereafter FID; the distance at which a response begins) and the modality of escape (i.e., walk, run, fly—an ordinal scale of energy intensity and rapidity of escape) [28,29]. We measure these in magpie-lark *Grallina cyanoleuca*, a ground-foraging and urban-exploiting species that frequently encounters dogs [30]. We examine whether magpie-larks respond differently to an approaching human and non-roaming dog if the dog is leashed.

2. Materials and Methods

Fieldwork was conducted in northwestern Melbourne, Victoria, Australia, in April and May 2022, 1100–1400 AEST, which is outside the breeding season in southern Australia [31]. Data were collected from five locations consisting of public parks and fields bordered by roads or residential estates where birds were common and humans and dogs were active. These were: Navan Park (−37.6696801° S, 144.5676491° E), Hannah Watts Park (−37.6835231° S, 144.5923241° E), Arthur Westlake Memorial Reserve (−37.6795405° S, 144.5485148° E), Arnolds Creek (−37.6707366° S, 144.5509778° E) and Kurunjang (−37.6621024° S, 144.5919494° E). Standardized approaches to magpie-larks were made using two different stimuli: a walker with an on-leash dog ("control") and a walker with the same dog (Chihuahua, approximately 2 kg, silent) off leash ("treatment", the leash was held in the investigator's hand). We recorded:

1. Starting distance between investigator and focal bird at the beginning of the approach. FID is strongly influenced by starting distance [30,32].
2. FID, a widely used metric of indexing escape behavior in animals [33,34].
3. Response mode (intensity) was recorded as an ordinal scale, from walk (1), run (2) to fly (3). There is a gradient in response intensity between urban and rural magpie-

larks [30]. This suggests that this metric may be sensitive to differing risk profiles they encounter.

The initial treatment was randomly selected at each location, and subsequent treatments were alternated so that two of each level of treatment were collected at each location. Treatments were balanced within and between locations.

During an approach, we ensured that there were no other stimuli nearby that could trigger a response. Magpie-larks were foraging on the ground, and we always approached on a grassy substrate in order to minimize noise. All approaches were made away from roads, whose proximity can influence magpie-larks FIDs [30]. An approach was made by measuring the starting distance between the approaching stimulus and the focal bird and then walking directly towards it at a slow pace (approximately 1 ms^{-1}). The dog remained approximately 1 m ahead of the approaching researcher, regardless of whether it was on or off leash (distance between dog and researcher, 0.8–1.1 m, regardless of treatment, Mann–Whitney U = 1.695, $p = 0.151$). The distance from the researcher at which the magpie-lark initiated an escape response, either by walking or flying, was recorded as FID. FIDs meeting our criteria (no bird approached more than once, treatments randomized and balanced across sites, dog silent and beside the investigator, no other disturbance evident) were difficult to collect, but we collected data from 20 magpie-larks, 10 from each treatment. All distances were measured to the nearest meter using a Kogan 900 m Laser Range Finder.

Statistical Analysis

The starting distance (34.5 ± 2.2 [SE] m) did not differ between the five study locations ($F_{4,19} = 1.576$, $p = 0.232$, $R^2 = 0.108$) or between the on-leash and off-leash stimuli ($F_{1,19} = 0.098$, $p = 0.758$, $R^2 = 0.005$), and there was no correlation between starting distance and FID ($F_{1,19} = 0.582$, $p = 0.455$, $R^2 = 0.031$). We therefore removed starting distance from all analyses to avoid overfitting the data.

We firstly logarithmically transformed the FID data to improve normality (log_{10}). ANOVA was used to test the correlation between FID and stimulus type. A logistical regression was used to test how escape responses varied with treatment. Non-parametric tests were used where data represented ranks, i.e., the intensity scale of response. All analyses were completed using SPSS [35]. We present means ± SEs throughout.

3. Results

All magpie-larks responded to our approaches by either walking, running, or flying away (FID, 8.5 ± 0.8 m, 5.2–17.6 m). Flight initiation distances did not vary significantly between treatments (on-leash, 7.6 ± 0.6 m; off-leash, 9.4 ± 1.4 m; $F_{1,19} = 1.072$, $p = 0.314$). However, the escape modality varied with the stimulus. A total of 30% magpie-larks that were approached by the on-leash treatment escaped by flying, whereas 80% escaped by flying in response to the off-leash treatment (Wald = 4.53, $n = 20$, $p = 0.033$). When expressed as a response intensity, higher-intensity escapes occurred when the approaching dog was unleashed (U = −2.433, $p = 0.029$; Figure 1). The bird's modal response evoked by the leashed dog was walking, while that for the unleashed dog was flying.

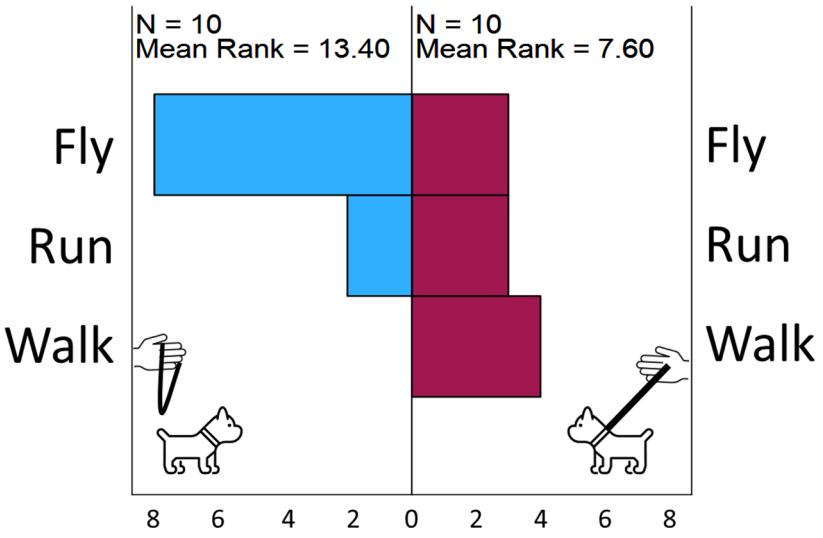

Figure 1. Response mode/intensity of magpie-larks to approaches by a walker with dog on and off leash. The right panel (**red**) shows responses of magpie-larks to a leashed dog; the left panel (**blue**) shows responses of Magpie larks to an unleashed dog at an equivalent distance from the owner.

4. Discussion

Although FID did not differ between treatments (although additional sampling and associated increases in power may result in a difference becoming apparent), unleashed treatments induced more intense escape modes in magpie-larks. This indicates the capacity to discriminate between unleashed and leashed dogs accompanying humans (i.e., using specific attributes of a stimulus to modify escape). Compared to rural birds, urban magpie-larks typically exhibit shorter FIDs and less intense responses [30], suggesting that they can adjust both aspects of escape. The urban magpie-larks in our study exhibited similar FIDs as reported elsewhere [30] but had higher intensity escape responses (e.g., flying) previously only observed in their rural counterparts [30], thus emphasizing the perceived threat of unleashed dogs to this urban bird species.

This study reported discrimination only in terms of response intensity, not FID, which suggests that such discrimination occurred relatively late during the approach, shortly before escape began. FIDs may differ owing to delays in cognition (delay in risk decision-making) or perceptive acuity (capacity to see the leash or its absence) in magpie-larks until the owner and dog are close, at which point intense escapes are the only option. Alternatively, magpie-larks may have learned to tolerate dogs up to a certain distance and to manage encounters with dogs presenting different risks by using different escape modes. Bernard et al. [17] reported similar patterns for magpie-larks that discriminated between walkers and fast and slow bicycles. FIDs did not differ, but the escape modality was more intense with quickly approaching stimuli. Several bird species have varying escape modes under circumstances where FID also varies with stimulus (e.g., [17,18,36]), as well as independent of FID (e.g., in this study).

The nuanced differentiation described here is expected when discrimination is adaptive. Birds living in urban areas benefit from highly developed escape decisions (i.e., contributing to the "cognitive buffer" evident in urban birds [37]), which must avoid numerous deadly stimuli, such as bicycles [17] or predators [21,38]. In urban parks, magpie-larks encounter many humans and dogs, where responses require time and energy [30]. As expected, the species makes decisions about escape distances and modes depending on various factors/attributes, such as the distance to a road or pathway [30], bicycles versus walkers [17], joggers versus walkers [18], and leashed versus unleashed dogs (in this study). Magpie-larks evidently display some of the most nuanced escape behavior among Australian birds (possibly an artefact of study effort).

We describe a cost to magpie-larks of unleashed dogs that extends beyond obvious chasing and harassment [23]. Fear of a small, unleashed dog evoked more intense, energetically demanding, and spatially disruptive escape responses than fear of a leashed dog (see [14,29]). The dog itself did not bark or roam, which might trigger avian escape responses [23,39]. Leashes prevent dog-roaming behavior, which can cause problems for magpie-larks, since unleashed dogs tend to move quickly and encounter birds [23,26,40]. Leashes have another benefit; namely, they reduce fear of an approaching dog, as measured by magpie-lark responses. Dog management in urban parks is controversial and typically includes areas for dogs off leash, on leash only, or "under effective control" (also known as "voice and sight control", where owners control dog behavior without a leash [38]). The magpie-lark response differed between on-leash and effective control prescriptions in our study. In many places, compliance with dog regulations is low, which affects avian escape responses [38,41,42]. In contrast to many dogs, our study dog was likely under a more effective control.

This study was conducted in autumn, in urban parks, and with one dog and the same handler. Although we report a higher intensity response by urban magpie-larks to this small, unleashed dog, bird responses are likely to vary spatiotemporally [30,43,44], according to the color, size and breed of dog species [26,45], and possibly in relation to the behavior of the handler. Additional studies using different dogs and handlers, and additional study species and sites, are required [46].

Evidence suggests that dogs may have a greater impact on bird abundance in rural [47] compared to urban environments [48]. There may be a greater need for dog-leashing laws or even the exclusion of dogs along the peri-urban boundaries of our cities when compared with inner-city public spaces, given that avian communities may be transitioning from recent rural histories and may be shaped by the novel human regime they face [49]. Understanding this relationship more fully will require studies to repeat our observations across more time periods (e.g., breeding season [31]) and areas (e.g., gardens [27,48,50]), using other bird species (e.g., [44]), dogs and handlers [12]. This must also include observations in rural settings with dogs off pathways, where studies have shown them to have larger impacts on bird diversity [47] and behavior (e.g., [30,36]).

Domestic dogs threaten at least 78 threatened bird species from 25 families [51]. A growing body of literature considers dogs' impact on urban wildlife populations (e.g., [41,47,52]), yet compliance to leashing laws remains low [26,38]. If dog owners understand how leash restrictions benefit wildlife, they are more likely to support them [36,42,53]. Coexistence between magpie-larks and people in parks would be enhanced by leashing dogs.

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