New methods for examining expertise in burglars in natural and simulated environments: preliminary findings

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Abstract

Expertise literature in mainstream cognitive psychology is rarely applied to criminal behaviour. Yet, if closely scrutinised, examples of the characteristics of expertise can be identified in many studies examining the cognitive processes of offenders, especially regarding residential burglary. We evaluated two new methodologies that might improve our understanding of cognitive processing in offenders through empirically observing offending behaviour and decision-making in a free-responding environment. We tested hypotheses regarding expertise in burglars in a small, exploratory study observing the behaviour of 'expert' offenders (ex-burglars) and novices (students) in a real and in a simulated environment. Both samples undertook a mock burglary in a real house and in a simulated house on a computer. Both environments elicited notably different behaviours between the experts and novices with experts demonstrating superior skill. This was seen in: more time spent in high value areas; fewer and more valuable items stolen; and more systematic routes taken around the environments. The findings are encouraging and provide support for the development of these observational methods to examine offender cognitive processing and behaviour.

New methods for examining expertise in burglars in natural and simulated environments: preliminary findings

We are in the early stages of applying what is known about expert decision-making in mainstream cognitive psychology to offending behaviour. This is an avenue worth developing as understanding the implicit decision-making of offenders has important lessons for crime prevention and interventions with experienced offenders. It is difficult, both ethically and logistically, to observe offending behaviour in action and the testing of hypotheses has been limited to interview methods and rudimentary experiments using maps and slides, often with incarcerated prisoners. While useful, these reconstructive methods with relatively unrealistic contextual cues fall short of observing actual behaviour. To that end, we assessed two new methods which would bring us closer to empirically observing actual offending behaviour in relevant criminogenic contexts. We tested hypotheses emerging from previous experimental and interview studies with burglars by, for the first time, observing a small number of experienced burglars undertaking a mock burglary in a real house and comparing their responses to an inexperienced control group consisting of postgraduate students. Second, we tested the same hypotheses with the same participants in a simulated 'virtual' version of the house on a laptop computer. If viable, simulated environments would be far easier to use with large groups of offenders than using real environments and real offenders (as we indicate below) and would open up numerous avenues of scientific study, using a more ecologically valid method than simple face-to-face interviews.

Expertise can be defined as the characteristics, skills and knowledge in a particular domain that distinguish specialists in any field from those new to it (Ericsson, 2006). Through repeated exposure to environments experts build up more complex and interconnected cognitive schemas (Chase & Simon, 1976; Fiske & Taylor, 1991) allowing them to recognise salient cues more quickly and accurately (Shanteau, 1992). Regarding burglary, research has noted the instantaneous use of cues by burglars during target selection (Bernasco & Luykx, 2003; Clare, 2011; Nee & Meenaghan,

2006;) and superior performance in relation to novices (householders, students, police officers and offenders without experience of burglary) in terms of speedier decision-making in relation to cues signifying greater value; better recognition memory for burglary related cues; more efficient use of decision-making heuristics and more systematic routes taken by burglars (Garcia-Retamero & Dhami, 2009; Logie, Wright & Decker, 1992; Nee & Taylor, 2000; Taylor & Nee, 1988; Wright, Logie & Decker, 1995). Comparing skill levels *within* experienced and less experienced burglars (Clare, 2011) has shown that practice increases competence in entering novel but familiar property types, suggesting more complex schemata in long term memory.

Less work has been carried out examining behaviour once *inside* the property, and findings need to be empirically validated in a free-responding methodology such as those examined in the current experiment. Wright and Decker (1994) and Nee and Meenaghan (2006) reported offenders' use of automatic procedural scripts enabling efficient, high yielding searches using routine and practised routes (similar to the 'route skeleton' heuristic noted in wayfinding expertise by Kuipurs, Tecuci & Stankiewicz, 2003)). Alongside the consistent finding that experienced burglars are more likely to enter at the rear of the property than novices the two studies above suggest that experienced burglars are also more likely to explore upstairs first and avoid bathrooms (Wright & Decker, 1994; Nee & Meenaghan, 2006).

Using these findings we put two free-responding methods to an empirical test. A small sample of experienced ex-burglars undertook mock burglaries in a real house and we compared their responses to students with no experience of offending. We hypothesised that burglars would search the house more efficiently than students (i.e., spending proportionately more time searching high value areas of the house) taking fewer, higher value items. We further expected that burglars compared to students would: navigate the house in a more systematic way using fewer routes; enter at the rear of the property; be unlikely to enter bathrooms; and be more likely to explore upstairs

first. We then tested the same hypotheses using a virtual environment, aiming to replicate the findings of the mock burglary in the real house.

Method

Participants

Six male ex-offenders (henceforth burglars), aged between 25 and 33, with extensive experience of residential burglary were recruited. All had been active for at least five years resulting in several hundred burglaries per head. Six male, post-graduate students, screened to ensure no experience of offending[i], aged 22 to 28, were recruited through advertisements and were used to control for experience of offending behaviour.

Challenges

Considerable challenges were associated with this project. First, obtaining the use of a typical residential house as householders were reluctant to allow ex-burglars into their houses. Negotiations with three police forces resulted in the use of a two-storey, residential property normally used as an interviewing suite for two days. Second, the recruitment of ex-offenders. After exhaustive advertising, ex-offenders were recruited from resettlement charities. Third, the time-consuming nature of each trial per participant (over 1 hour). These challenges combined resulted in small sample sizes.

Procedure

The real house comprised a kitchen, study, living room and toilet downstairs. Upstairs was an interview recording room set up like a music room and two rooms made to look like a teenage boy's and girl's bedroom. Typical items targeted by burglars (e.g. laptops, mobile phones, wallets) were placed in predictable places around the house (based on previous research). There was a small front garden and a driveway to the left of the house which led to the back garden and access to the back door.

A simple, navigable, 3D virtual simulation of the house was modelled on a laptop to represent the real house in a basic way (see Figure 1). Most items (including valuable or otherwise) could be stolen by clicking on the item to make it disappear, and these were positioned identically to that of the real house. The house could be entered by both the front and back door and was navigable using a mouse.

Insert Figure 1 about here

After giving informed consent participants were fitted with a head-mounted camera. They were asked to stand at the front gate of the property, to enter the property and to 'burgle' it in their own time by exploring the house and touching items that they would like to take, returning to the researcher once they had finished. Touching rather than removal of the items was chosen to reduce potential damage to items and to reduce testing time (as articles would have to be replaced in identical positions before each trial.

After completion, each participant was shown the video from the head-mounted camera and asked to 'talk through' their approach to the burglary which was audio-taped (rather than to 'think aloud' during the burglary which would increase cognitive load and would make the burglary unrealistic). Participants then undertook a filler task (spelling a list of words on the wall backwards) followed by the mock burglary in the simulated house on the laptop with identical instructions. They were seated at a desk in front of the laptop with a view of the simulated house from the street. They were given a quick demonstration of how to navigate the simulated environment in front of the house on the laptop using the mouse. They were told they could click on doors to open them and click on items to steal them. They were then positioned at the identical spot at the front gate in the virtual environment as in the real environment and asked to burgle the house in their own time, returning to the front gate when finished. They were only informed about this second burglary at this stage to reduce rehearsal from one burglary to the other. This mock-burglary of the simulated house was again videoed using the head-mounted camera, and afterwards the participants were

again shown their videos and interviewed. Half of each group began with the real life house followed by the simulation (described above) and the other half began with the simulation followed by the real house. Data regarding routes taken, time to commit the burglary, nature, number and value of items taken in each condition were coded and analysed.

Results

Exploration and navigation of the real house

As predicted, burglars spent significantly more time searching the higher value areas of the house (*Mdn* = 58%) as a proportion of total time than students (*Mdn* = 20%, *U* <0.0001, *p* = 0.005, *r* = .80). Burglars spent most of their time in the valuable downstairs rooms, while students spent 20 seconds on average in all rooms equally. The strong effect size indicates the magnitude of the effect.

There was no significant difference between the groups in the overall number of items taken from the house but central tendencies were in the expected direction (Burglars: *Mdn* = 28.5, Range = 10; Students: *Mdn* = 34, Range=30, *U* = 17.5, *p* = .936 n.s.). The spread of response was considerably wider for students indicating less honing of skill. However, the value of the items taken by burglars was higher and this difference approached statistical significance with a notable effect size (*U* = 9, *p* = .074, *r* = .40). The sample size is likely to have made the analysis underpowered and a larger sample may well have produced a statistically significant difference. The value of the burglars' haul was worth nearly £1000 more (Burglars: *Mdn* = £4875, Range = £850; Students: *Mdn* = £3945, Range = £3520) and again a markedly wider range was found in the student group. Students were unaware of the value of designer bags with cash, wallets and phones inside, and failed to notice leather jackets in the hallway. The upstairs recording room also divided groups. Burglars, suspicious of this more atypical room, spent little time here taking a total of five items. Students, oblivious to this, took 26 items.

Burglars navigated the house in a different way to students, all entering and exiting at the rear (all students doing so at the front door, $\chi 2$ (1), n=12) = 12.00, p = 0.001). Students were unaware that the front door was completely exposed to onlookers and were also unaware of the easy rear access. Once inside burglars focussed on the high value[ii] areas of bedrooms and downstairs rooms to the exclusion of the recording room and the bathroom, all of which students entered using a variety of routes, suggesting greater naivety and less script-like knowledge in students. As predicted, three out of six burglars began their search upstairs (all students started downstairs) and all six burglars chose one of only two routes ($\chi 2$ (1), n =12) = 4.00, p = 0.046).

Exploration and navigation of the simulated house

Very similar findings were found in comparison to the real house in relation to: time spent in higher value areas (*U* = 4, *p* = .038, *r* = .54, Burglars: *Mdn* = 44%, Range = 20 Students: *Mdn* = 37%, Range = 25); overall *number* of items taken from the house (*U* = 11.5, *p* = .831 n.s., Burglars: *Mdn* = 39, Range = 9; Students: *Mdn* = 34, Range = 12); and *value* of items (*U* = 7, *p* = .071, *r* = 42, Burglars: *Mdn* = £4120, Range = £940; Students: *Mdn* = £3477, Range = £1550). Larger ranges were again evident in the student group in relation to item choice and value and effect sizes were again impressive. Similarly, all burglars entered the simulated house at the rear, all students at the front ($\chi 2$ (1), n=12) = 12.00, p=0.001). Once inside, three out of five[1] burglars explored upstairs first entering high value bedrooms initially and all but one burglar took an identical route when upstairs (while students were notably haphazard with no pattern emerging). In contrast, all but one student explored downstairs first ($\chi 2$ (1), n=11) = 7.60, p =0.006). Burglars used a variety of routes to explore downstairs, but students were more consistent with four out of six following a living room, study, kitchen pattern.

[1] The laptop route failed to record for one burglar so n=5 (it was noted that he had entered and exited at the rear).

Burglars unexpectedly spent a little more time overall (Mdn = 5.6 minutes, Range = 7 minutes) than students (Mdn = 3.8 minutes, Range = 5 minutes, U = 12, p = 0.168 n.s) in the real house. This was likely because the burglars were more persistent than the students, resulting in more valuable burglaries. In the simulated house there was little difference in time spent overall between burglars (*Mdn* = 4 minutes, Range = 4.7 minutes) and students (*Mdn* = 4.25 minutes, Range = 6 minutes, *U* = 14, *p* = 0.261 n.s). The basic modelling in the simulation made it a little too obvious which items to steal (though burglars still had a more profitable haul than students). These two unexpected findings have been useful in highlighting the importance of providing relatively rich and realistic environments in future work.

Discussion

As predicted burglars undertook more efficient burglaries, spending significantly more of their time (proportionately) in lucrative parts of the property, indicating domain-specific knowledge allowing for instant recognition of more valuable areas of each room, which resulted in taking fewer and higher value items. Regarding way-finding, burglars stuck to a narrower range of routes, suggesting that automatic decision-making based on structural representations in memory were playing out (Chase & Simon, 1976; Fiske & Taylor, 1991). All-in-all, the much narrower distribution of response from burglars in almost all measures within this environment and the strong effect sizes supported the idea of a more discriminate, systematic and practised approach to the tasks at hand (Ericsson, Krampe & Tesc-Romer, 1993).

Several limitations should be noted in relation to this exploratory study. The sample sizes were very small making the findings underpowered, and the study needs replicating with larger, more representative samples. Both environments were relatively impoverished in terms of the goods that would be available in a real burglary and items could only be touched or clicked on. The

direction of the findings however, and the considerable magnitude of the effects associated with them, show real promise for the development of these methodologies.

These limitations acknowledged, empirical observation of the actual behaviour of albeit a small sample of offenders in comparison to non-offenders strongly supported previous interview and experimental data on expertise in offenders in both conditions indicating that these methods are likely to be able to distinguish levels of expertise and improve our understanding in the field.

Predictions made were generally borne out in both environments, representing proof in principle that these methods are both worth pursuing. Eliciting and observing actual behaviour in natural environments, even though somewhat staged, provided compelling evidence in a small sample of participants, of the predicted cognitions and actions emerging from mainstream psychological science. Observing data collection using this method suggested that there will be numerous new hypotheses generated by offenders through watching their unprompted behaviour for burglary and other types of less well studied offending behaviour.

The finding that the simulated environment triggered almost identical behaviour in the participants was an important one. This method is a lot easier to undertake than recruiting ex-offenders to real environments and it will be worth examining whether the two methods continue to reveal the predicted differences between experts and non-experts if examined in a between-subjects design using larger sample and more matched control groups. If this is the case, a range of simulated environments can be created and used to study a wide range of offending behaviour with both incarcerated and active offenders. Simulated environments have been considered reliable methods for some time to train a variety of professionals such as surgeons, pilots and soldiers (see e.g. Gallagher et al, 2004) with accruing evidence that participants behave in the same way in real and virtual environments (Slater et al, 2013). Work has already been conducted on fear of crime

(Park et al, 2012) and our exploratory work here shows that they are likely to have a notable part to play in our enhanced understanding offending behaviour.

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Front view of house

Rear view of house

Figure 1. Front and exterior examples of simulated house

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[i] This was established via email after potential participants responded to the advertisement. The importance of having no offending experience of any type was stressed and consequently four potential participants could not be used.

[ii] These were areas where higher value items were concentrated.