

Table S1: Trial-by-trial description of Experiment 1 (see full legend in ‘Legends for Supplementary Materials’)

Trial	Trial code	Duration	Tool dimensions	Description
1	Os	09:00	90 × 3.5	Used her own tool (feather shaft).
2	Uf	01:00	90 × 3.5	Probed for 2 seconds with unmodified tool, which was then dropped irretrievably into tube. Trial aborted.
3	Ms	06:36	120 × 3.5	Probed 9 times with the straight tool (for 2min 36s). 3min 31s after the start of the trial, slightly modified the tool by poking against base of tube, and probed with this 8 times (for 1min 53s), almost raising bucket on several occasions. After 6min 15s, poked the tool into Gaffa tape (bottom of tube) and twisted proximal end into L-shape. Turned the tool around, and used L-shape to retrieve bucket.
4	Ms	03:19	105 × 3.5	Probed twice (for 16 seconds total) with the unmodified tool. After 27s, modified tool slightly by poking into Gaffa tape (bottom of tube) and twisting proximal end to form a 45° bend. Probed 3 times with unmodified end (for 27s), then turned around and probed 7 times with modified end (for 1min 35s), interspersed with poking tool at Gaffa tape (but no apparent additional modification). Almost raised bucket twice before final success.
5	Us	01:46	105 × 3.5	Probed 6 times (for 1min 24s) with the unmodified tool, and eventually managed to wedge the tool into the sticky tape holding the bucket’s handle on and thus successfully withdraw the bucket.
6	Mf	01:28	90 × 3.5	Probed 5 times (for 46s) with unmodified tool, interspersed with poking at Gaffa tape at base of tube. After 1min 13s, wedged proximal end into Gaffa tape and twisted distal end into a 360° helix. Probed once for 9s with unmodified end, then dropped (seemingly accidentally) irretrievably into tube.
7	Ms	01:14	90 × 3.5	Probed twice with unmodified tool (for 8s). After 14s, modified tool slightly (~30° bend in middle) by poking end onto Gaffa tape. Probed twice (for 8s) with the slightly modified tool. After 36s, wedged distal end in Gaffa tape (bottom of tube) and twisted proximal end into a slight helix, with a bend of around 50°. Probed once (for 21s) with the unmodified end, then turned tool around and probed once (for 4s) with the modified end, retrieving the bucket.

8	Ms	00:49	90 × 3.5	Probed twice with the unmodified tool (for 15s). After 25s, wedged distal end in Gaffa tape (bottom of tube) and twisted proximal end around beak to form two bends, one of 90° and one of ~60° back in the other direction. Turned around <i>before</i> using, and probed once (for 8s) with the modified end, retrieving the bucket.
9	Mf	00:37	90 × 3.5	Probed once (for 6s) with unmodified tool. After 10s, wedged distal end in Gaffa tape (bottom of tube) and twisted proximal end around 90° (in 2 bends), yielding an L-shaped tool with the bend roughly in the middle. Probed once for 11s with unmodified end, then turned around and probed once (for 3s) with modified end, then dropped (seemingly accidentally) irretrievably into tube. Tool seemed too short after the bend to reach the bucket's handle.
10	Ms	01:02	90 × 3.5	Arrived with her own stick tool, but immediately dropped it into the tube. Probed twice (for 10s) with unmodified tool. After 29s, wedged distal end in Gaffa tape (bottom of tube) and twisted proximal end several times into a large hook-like shape. Probed once (for 13s) with the unmodified end, then turned around and probed once (for 7s) with the modified end, retrieving the bucket.
11	Ms	00:24	90 × 3.5	Probed once (for 2s) with unmodified tool. After 9s, wedged distal end in Gaffa tape (bottom of tube) and twisted proximal end once to form a large 90° L-shape. Immediately turned around (without probing), and probed once (for 3s) with the modified end, retrieving the bucket.
12	Ms	00:18	90 × 3.5	Probed once (for 2s) with unmodified tool. After 7s, wedged distal end in Gaffa tape (bottom of tube) and twisted proximal end once to form a small 90° L-shape. Immediately turned around (without probing), and probed once (for 5s) with the modified end, retrieving the bucket.
13	Ms	01:23	90 × 3.5	(N.B. 3 days later.) Probed 3 times (for 19s) with unmodified tool. After 1min 15s (there were times when she was not manipulating the tool), wedged distal end in Gaffa tape (bottom of tube) and twisted proximal end once to form a small V-shape. Immediately turned around (without probing), and probed once (for 2s) with the modified end, retrieving the bucket.
14	Mf	01:46	90 × 3.5	Probed twice (for 3s) with unmodified tool, interspersed by poking Gaffa tape. After 37s (she flew elsewhere in the room for a while), wedged distal end in Gaffa tape (bottom of tube) and twisted proximal slightly (~15° angle). Turned around and probed twice (for 9s) with the modified end. Again wedged distal end in Gaffa tape and twisted a little more (in the middle of the tool, ~30° angle). Probed twice (for 13s) with the same end as previously, then turned around and probed once (for 4s) with the other end, before dropping wire into tube.

15	Ms	00:24	90 × 3.5	(N.B. 2 days later.) Probed once (for 5s) with the unmodified tool. After 11s, wedged distal end in Gaffa tape (bottom of tube) and twisted proximal end into ~150° V-shape using beak. Immediately turned around (without probing), and probed once (for 5s) with the modified end, retrieving the bucket.
16	Ms	00:38	90 × 3.5	Probed once (for 3s) with unmodified tool. After 17s, wedged distal end in Gaffa tape (bottom of tube) and twisted proximal end twice (~180°) into spiral. Probed once with unmodified end (for 1s), then turned around and probed once with modified end (for 3s), retrieving the bucket.
17	Ms	00:28	90 × 5.0	Probed once (for 2s) with unmodified tool. After 15s, wedged distal end in Gaffa tape (bottom of tube), and <i>bent</i> (not twisted) proximal end into V-shaped hook (~120° bend). Immediately turned around, and probed once (for 3s) with modified end, retrieving the bucket.
18	Ms	00:24	90 × 5.0	Probed once (for 5s) with the unmodified tool. After 12s, wedged distal end in Gaffa tape (bottom of tube), and bent proximal end into V-shaped hook (~120° bend). Immediately turned around, and probed once (for 4s) with modified end, retrieving the bucket.
19	Ms	00:43	90 × 5.0	Probed once (for 2s) with the unmodified tool. After 21s, wedged distal end in Gaffa tape (bottom of tube), and bent proximal end 3 times into triangular shape (1 bend of ~20° degrees backwards, then 2 bends forwards by ~120°; she initially bent it just once into a V-shape, but the other bends happened as she appeared to be trying to remove the tool from the Gaffa tape). Immediately turned around, and probed once (for 5s) with modified end without retrieving the bucket. Put the tool down again and turned it around the shaft (i.e. still holding the same end, but rotating around the shaft 180°), probed again with the modified end (for 2s), retrieving the bucket.
20	Os	01:47	90 × 5.0	Probed once (for 3s) with the unmodified tool. After 10s, wedged the distal end in Gaffa tape (bottom of tube), and twisted proximal end into a spiral. Immediately turned around, and probed 5 times (for 32s) with the modified end of the tool, interspersed by putting it down and picking it up again having readjusted grip. After 1min 47s, dropped tool irretrievably into well. Left the testing room, but returned with her own twig tool before the experimenter had removed the apparatus, and used this to retrieve the bucket (and aluminium tool).

21	Ms	00:44	90 × 5.0	After 17s, wedged distal end in Gaffa tape (bottom of tube), and bent proximal end twice to form a rough hook shape. Immediately turned around, and probed once (for 12s) with modified end, retrieving the bucket.
22	Os	01:36	90 × 5.0	After 13s, wedged distal end in Gaffa tape (bottom of tube), and bent middle (but slightly nearer beak) of the tool ~80°. Turned around immediately, and probed three times (for 19s) with modified end, partially raising the bucket once, but the bend was too near the middle for complete success. After 2min 50, probed behind the brick with the tool and dropped it there (out of reach). Left the testing room and returned with her own twig, which she used to probe behind the brick and retrieve a waxworm (missed by the experimenter when preparing the apparatus). Then used the twig to probe 4 times for the bucket, eventually retrieving it. Note that between probes, she wedged the end of the twig in the Gaffa tape (bottom of tube) 3 times, and performed similar actions to it that she uses with the aluminium tool.
23	Ms	00:21	90 × 3.5	After 14s, wedged distal end into Gaffa tape (bottom of tube) and bent proximal end into ~90° degree small hook. Turned around immediately, and probed once (for 7s) with modified end, retrieving the bucket.
24	Ms	01:06	90 × 5.0	(2 days later). Probed 3 times (for 6s) with unmodified ends (these were classed as probes because she inserted the tool into the tube, but she only contacted the handle of the bucket on one of them). After 52s, poked distal end against Gaffa tape (bottom of tube), and caused the tool to bend very slightly (~5°) at the proximal end. Immediately turned around, and probed once (for 5s) with the slightly modified end, retrieving the bucket.
25	Ms	00:36	90 × 5.0	Probed twice (for 3s) with unmodified end (did not contact bucket handle). After 11s, wedged distal end in hole in wooden block and bent the proximal end by ~45°. Immediately turned around, and probed once (for 6s) with the modified end, retrieving the bucket.
26	Os	00:04	90 × 5.0	Arrived with her own tool, and used successfully.
27	Ms	01:44	90 × 5.0	(18 days later) Probed 7 times (for 44s) with unmodified tool, turning it around 3 times in between probes. After 1min 33s, wedged distal end in Gaffa tape (bottom of tube) and bent proximal end 180° to form a neat hook. Immediately turned around and probed once (for 1s) with the modified end, retrieving the bucket.

28	Ms	00:32	90 × 5.0	Probed twice (for 6s) with unmodified tool. After 20s, wedged distal end in Gaffa tape (bottom of tube) and bent proximal end ~110° to form a hook. Immediately turned around and probed once (for 6s) with the modified end, retrieving the bucket.
29	Ms	02:01	90 × 5.0	Probed once (for 1s, did not contact bucket handle) with unmodified tool. After 6s, poked distal end of tool against Gaffa tape (bottom of tube), and bent proximal end very slightly (~5°). Immediately turned around, and probed once (for 3s) with slightly modified end. After 33s, again poked distal end against Gaffa tape (bottom of tube) and bent <i>distal</i> end a further 5° or so. Did <i>not</i> turn around, and probed 3 times (for 51s) with slightly modified end, almost raising the bucket 3 times. After 1min 47s, poked distal end against Gaffa tape (bottom of tube) and bent proximal end ~150° into large hook. Immediately turned around and probed once (for 6s) with modified end, retrieving the bucket.
30	Ms	00:18	90 × 5.0	Probed once (for 3s) with unmodified tool. After 6s, poked distal end of tool against Gaffa tape (bottom of tube), and bent the proximal end into ~80° hook. Immediately turned around and probed once (for 3s) with modified end, retrieving the bucket.
31	Ms	00:31	90 × 5.0	Probed once (for 1s, did not contact bucket) with unmodified tool. After 14s, poked distal end against Gaffa tape (bottom of tube), and bent the proximal end into ~150° hook. Immediately turned around and probed twice (for 10s) with modified end, adjusting her grip in between probes, retrieving the bucket.
32	Ms	00:13	90 × 5.0	(167 days later) After 4s, poked distal end against Gaffa tape (bottom of tube), and bent the proximal end into ~150° hook. Immediately turned around and probed once (for 5s) with modified end, retrieving the bucket.
33	Ms	00:11	90 × 5.0	After 2s, poked distal end against Gaffa tape (bottom of tube), and bent the proximal end into ~150° hook. Immediately turned around and probed once (for 3s) with modified end, retrieving the bucket.
34	Mf	00:42	90 × 5.0	Picked up the tool and immediately left the testing room. Returned 5 minutes later with the tool (still unmodified), and poked the distal end against the Gaffa tape (bottom of tube), and bent the proximal end very slightly (~5°) with her beak. Immediately turned around, looked into the tube but did not probe, and again poked the distal (now slightly modified end) against the Gaffa tape (bottom of tube) and slightly bent the proximal end (again, by ~5°). Turned around again, but in the process dropped the tool irretrievably behind the brick.
