**Supplemental Digital Content 3**

**TIDieR checklist for individual studies**

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|  | Item 1 | Item 2 | Item 3 | Item 4 | Item 5 | Item 6 | Item 7 | Item 8 | Item 9 & 10 | Item 11 & 12 |
| Study | Name of Rx | Rationale | Materials | Activities | Provider | Mode of delivery | Location | Dosage | Tailoring & Modifi-cations | Fidelity & Adherence |
| Contingency learning based interventions to improve feeding outcomes | | | | | | | | | | |
| Standley JM 2003 28 | Pacifier activated Lullaby | Contingent music reinforcement using auditory stimuli | i. Minimam Newborn Orthodontic Pacifier (adapted)  ii. Cassette tape recorder (Radio Shack  CTR-62, Tandy Corporation, Fort Worth, TX)  iii. Lullaby: sung bfemale vocalist, played at 62 dB(C)/55 dB(A) | PAL session 3 0-60 minutes before infant’s afternoon feed | Music therapist | In person/  1 on 1 | NICU | Sessions:  5 sessions, once per day  Session Length:  15 minutes  Total time:  60 minutes  1 time/day,  15minutes,  5 days | None | Not reported |
| Usual care NNS | Usual pacifier stimulation | Pacifier | Not reported | Medical staff | NICU | Not reported | None | Not reported |
| Standley JM 2010 29 | Pacifier activated Lullaby | Contingent reinforcement using auditory stimuli | i. PAL device with Wee Soothie® pacifier  ii. Lullaby: sung by young female with no changes in tempo/volume/ key  iii. CD player: music played at 65 dB, Scale C, 1 volume bar | i. PAL session 3 0 minutes before infant’s feeding time  ii. Infant position: side-lying or on their back in the crib  iii. Lullaby played when infant reached a threshold suck pressure (minimum 1 bar on PAL machine) | Music therapist | In person/  1 on 1 | NICU | Sessions:  1 session, once  Session Length:  15-20 minutes  Total time:  15-20 minutes | Day of Rx decided based on infant’s stress levels | Not reported |
| Usual care NNS | Usual pacifier stimulation | Pacifier | Pacifier induced NNS 3 0 minutes before infant’s feeding time | Medical staff | NICU | Not reported | None | Not reported |
| Chorna OD 2014 3 0 | Pacifier activated mother’s voice - 3 trials | Contingent reinforcement with salient stimuli | i. PAL (Powers Device Technologies  St Johns, FL) device: sensor, pacifier, receiver  ii. PCM-M10  Portable Linear PCM Voice Recorder (Sony, New York, NY)  iii. 2 Children’s songs recorded in mother’s voice | i. PAM session 3 0-45 minutes before infant’s feeding time  ii. Infant position: side-lying in the crib  iii. Mother’s song played when infant reached a threshold suck pressure | Music therapist | In person/  1 on 1 | NICU | Sessions:  3 sessions, once per day  Session Length:  15 minutes  Total time:  27 minutes | None | Not reported |
| Pacifier activated mother’s voice - 1 trials | Music therapist | NICU | Sessions:  1 session, once  Session Length:  15 minutes  Total time:  15 minutes |  | Not reported |
| Usual care NNS | Usual pacifier stimulation | Pacifier | i. Pacifier induced NNS 3 0-45 minutes before infant’s feeding time | Not reported | NICU | Not reported | None | Not reported |
| Contingency learning interventions to improve motor and cognitive outcomes | | | | | | | | | | |
| Needham 2002 3 1 | Closed sticky mittens training | Contingent reinforcement to promote active engagement and exploration of objects  Perception-action-cognition linkage | i. 3 sets of toys:  Set 1- wooden blocks  Set 2- black plastic rings of four shapes  Set 3 - plastic cubes  ii. Soft fleece mittens with velcro soft side sewn on palm of mitten  iii. Activity log for parents | i. Parents offered 3 sets of toys (one at a time) to infant.  ii. Parents could encourage reaching by drawing infant’s attention to toy. | Parent-led Psyc. guided | In person/  1 on 1 | Home | Sessions:  10 sessions, over 2 weeks  Session Length:  10 minutes  Total time:  100 minutes | Toy selection was at parent’s discretion | F: Not reported  C: ✓ Training log |
| No treatment | Not applicable | | | | | | | | |
| Libertus 2010 3 2, 20113 3 | Closed sticky mittens training | Contingent reinforcement to promote active engagement and exploration of objects  Perception-action-cognition linkage | i. Custom-made closed infant mittens with Velcro® (loop) sewn to the palm (no haptic contact with toy)  ii. A set of 6 Duplo® blocks (same color)- Velcro hook attached to blocks  iii. Printed study instructions | i. Parents demonstrated the sticky mechanism, one time at the start.  ii. Infants were encouraged to reach for the blocks and self-explore.  iii. Parents were allowed to direct infant’s attention to blocks.  iv. If the infant contacted the toy, they were allowed to retain it for 10 seconds before placing it back on the table  v. Infant position: seated on parent’s lap (facing away from parent) | Parent-led Psyc. guided | In person/  1 on 1 | Home | Sessions:  10 sessions, over 2 weeks  Session Length:  10 minutes  Total time:  100 minutes | None | F: ✓ Tracked by observing in-home Rx, 3 -4 times  C: ✓  Training log |
| Non-sticky mittens observation training | Passive reaching experience and object exposure | i. Custom-made closed infant mittens with Velcro® (loop) sewn to the palm (no haptic contact with toy)  ii. A set of 6 Duplo® blocks (same color)- electrical tape attached to blocks  iii. Printed study instructions | i. Parents moved the blocks within infant’s visual field in a specific pattern.  ii. Parents touched the infant’s palm with the block.  iii. Infants did not experience self-produced reaching.  iv. Infant position: seated on parent’s lap (facing away from parent) | Parent-led Psyc. guided | Home | Sessions:  10 sessions, over 2 weeks  Session Length:  10 minutes  Total time:  100 minutes | None |
| No treatment 3 -month-olds | Not applicable | | | | | | | | |
| No treatment 5-month-olds |
| Libertus 20163 4  (FU to Libertus 2010) | Closed sticky mittens training | Contingent reinforcement to promote active engagement and exploration of objects  Perception-action-cognition linkage | i. Custom-made closed infant mittens with Velcro® (loop) sewn to the palm (no haptic contact with toy)  ii. A set of 6 Duplo® blocks (same color)- Velcro hook attached to blocks  iii. Printed study instructions | i. Parents demonstrated the sticky mechanism 1 time at the start.  ii. Infants were encouraged to reach for the blocks and self-explore.  iii. Parents were allowed to direct infant’s attention to blocks.  iv. If the infant contacted the toy, they were allowed to retain it for 10 seconds before placing it back on the table  v. Infant position: seated on parent’s lap (facing away from parent) | Parent-led Psyc. guided | In person/  1 on 1 | Home | Sessions:  10 sessions, over 2 weeks  Session Length:  10 minutes  Total time:  100 minutes | None | F: ✓ Tracked by observing in-home Rx, 3 -4 times  C: ✓  Training log |
| Non-sticky mittens observation training | Passive reaching experience and object exposure | i. Custom-made closed infant mittens with Velcro® (loop) sewn to the palm (no haptic contact with toy)  ii. A set of 6 Duplo® blocks (same color)- electrical tape attached to blocks  iii. Printed study instructions | i. Parents moved the blocks within infant’s visual field in a specific pattern.  ii. Parents touched the infant’s palm with the block.  iii. Infants did not experience self-produced reaching.  iv. Infant position: seated on parent’s lap (facing away from parent) | Parent-led Psyc. guided | Home | Sessions:  10 sessions, over 2 weeks  Session Length:  10 minutes  Total time:  100 minutes |  |
| Control (No training) | Not applicable | | | | | | | | |
| Libertus 2014 3 5 | Closed sticky mittens training | Contingent reinforcement to promote active engagement and exploration of objects  Perception-action-cognition linkage | i. Custom-made closed infant mittens with Velcro® (loop) sewn to the palm (no haptic contact with toy)  ii. A set of 6 Duplo® blocks (same color)- Velcro hook attached to blocks  iii. Printed study instructions | i. Parents demonstrated the sticky mechanism 1 time at the start.  ii. Infants were encouraged to reach for the blocks and self-explore.  iii. Parents were allowed to direct infant’s attention to blocks.  iv. If the infant contacted the toy, they were allowed to retain it for 10 seconds before placing it back on the table  v. Infant position: seated on parent’s lap (facing away from parent) | Parent-led Psyc. guided | In person/  1 on 1 | Home | Sessions:  10 sessions, over 2 weeks  Session Length:  10 minutes  Total time:  100 minutes | None | F: ✓  Bi-weekly home-visits, recording of sessions  C: ✓  Training log, bi-weekly phone calls |
| Non-sticky mittens observation training | Passive reaching experience and object exposure | i. Custom-made closed infant mittens with Velcro® (loop) sewn to the palm (no haptic contact with toy)  ii. A set of 6 Duplo® blocks (same color)- electrical tape attached to blocks  iii. Printed study instructions | i. Parents moved the blocks within infant’s visual field in a specific pattern.  ii. Parents touched the infant’s palm with the block.  iii. Infants did not experience self-produced reaching.  iv. Infant position: seated on parent’s lap (facing away from parent) | Parent-led Psyc. guided | Home | Sessions:  10 sessions, over 2 weeks  Session Length:  10 minutes  Total time:  100 minutes | None |
| Encouragement experience | Parent provided positive reinforcement to reaching (not contingent on infant’s actions) | i. Wrist rattle closed to form a graspable loop  ii. Printed study instructions | i. Parents moved a wrist rattle from just beyond the infant’s reach to near their hand while commenting on its color, shape, or sound.  ii. No physical help to facilitate reaching was provided  iii Infant position: seated in a seater facing the parent  iv. *No mittens used* | Parent-led Psyc. guided | Home | Sessions:  10 sessions, over 2 weeks  Session Length:  10 minutes  Total time:  100 minutes | None |
| Movement experience | Passive exposure to reaching opportunities provided by parents | i. wrist rattle closed to form a graspable loop  ii. Printed study instructions | i. Parents provide physical help for reaching by attaching the toy to the infant’s wrist  ii. No verbal cues were provided  iii. Infant position: seated in a seater facing the parent  iv. *No mittens used* | Parent-led Psyc. guided | Home | Sessions:  10 sessions, over 2 weeks  Session Length:  10 minutes  Total time:  100 minutes | None |
| Rakison 2012 3 6 | Closed sticky mittens training | Contingent reinforcement to promote active engagement and exploration of objects  Impact of causal action experience (contingent reaching) on causal perception | i. A tray of four green balls (3 cm diameter) covered in velcro  ii. Soft fleece mittens with velcro soft side sewn on palm of mitten (red colored) | i. Infants were allowed to freely interact with balls  ii. If the infant made a sticky contact with the ball, they were allowed to retain it for 10 seconds before placing it back on table  iii. Infant position: Supported sitting on caregiver’s lap in front of a table at chest level | Psyc. led | In person/  1 on 1 | Research Lab | Sessions:  1 session, once  Session Length:  3 minutes  Total time:  3 minutes | None | Not applicable |
| Non sticky mittens movement training | Impact of non-causal action experience (reaching) on causal perception | i. A tray of four green balls (3 cm diameter) glued to the tray  ii. Soft fleece mittens (red colored) | i. Infants were allowed to freely interact with balls  ii. Balls were glued to tray so they could not move even if a contact was made  iii. Infant position: Supported sitting on caregiver’s lap in front of a table at chest level | Psyc. led | Research Lab | Sessions:  1 session, once  Session Length:  3 minutes  Total time:  3 minutes | None |
| Gerson 2014 a, 3 72014 b 3 8 | Closed sticky mittens training | Impact of causal action (contingent reaching) on causal perception | i. A toy bear and toy ball with velcro  ii. Soft fleece mittens with velcro soft side sewn on palm of mitten | i. The experimenter moved the 2 toys to get infant’s attention  ii. If the infant made a sticky contact with the ball, they were allowed to retain it as long as they maintained visual contact  iii. Infant position: Supported sitting on caregiver’s lap | Psyc. Led | In person/  1 on 1 | Research Lab | Sessions:  1 session, once  Session Length:  3 minutes  Total time:  3 minutes | None | Not applicable |
| Non-sticky mittens observation training | Impact of non-causal action experience (reaching) on causal perception | i. . A toy bear and toy ball without velcro  ii. No mittens | i. A yoked paradigm was used: object exposure to toy was matched to that of sticky mitten group  ii. Experimenter wore a sticky mitten and moved the toys to attract the infant’s attention | Psyc. Led | Research Lab | Sessions:  1 session, once  Session Length:  3 minutes  Total time:  3 minutes |  |
|  | Control (No training) | Not applicable | | | | | | | | |
| Williams 2015 3 9 | Open Sticky mittens | Disentangling the effects of simulated reaching (using sticky mittens) from repeated task exposure  Perception-action-cognition linkage | i. Total 40 toys; colorful Peek-a-Blocks (Fisher-Price, East Aurora, NY) and plastic animal squirt toys (Target Corp., Minneapolis, MN) with velcro attached  ii. Mittens modified from infant bobby socks with fingers exposed and velcro attached  iii. Custom made infant seat reclined 10 degree from vertical and a strap around torso for providing trunk support | i. Experimenter presented the infants with one toy at a time  ii. The toy was replaced if the infant did not reach for it within one minute  iii. If the infant contacted the toy with mittens, they were allowed to retain it for 10 seconds before placing it back on table  iv. No verbal cues were provided, and toys were not touched to the infant’s hands  v. Infant position: supported seating in a seat with full trunk support | Parent-led Psyc. guided | In person/  1 on 1  In person/  1 on 1 | Home | Sessions:  10 sessions, over 2 weeks  Session Length:  10 minutes  Total time:  100 minutes | Use of open sticky mittens for haptic feedback  Controlling for verbal cues  Focusing on reaching kinematics by controlling toy presentation location and frequency | F: Not reported  C: Not reported |
| Non sticky mittens movement training | Disentangling the effects of simulated reaching (using sticky mittens) from repeated task exposure  Perception-action-cognition linkage  Haptic feedback for reaching and object exploration | i. Total 40 toys; colorful Peek-a-Blocks (Fisher-Price, East Aurora, NY) and plastic animal squirt toys (Target Corp., Minneapolis, MN)  ii. Mittens modified from infant bobby socks with fingers exposed  iii. Custom made infant seat reclined 10 degree from vertical and a strap around torso for providing trunk support | i. Experimenter presented the infants with one toy at a time  ii. The toy was replaced if the infant did not reach for it within one minute  iii. No verbal cues were provided, and toys were not touched to the infant’s hands  iv. Infant position: supported seating in a seat with full trunk support | Parent-led Psyc. guided | Home | Sessions:  10 sessions, over 2 weeks  Session Length:  10 minutes  Total time:  100 minutes | Use of open sticky mittens for haptic feedback  Controlling for verbal cues  Focusing on reaching kinematics by controlling toy presentation location and frequency |
| Control (No training) | Not applicable | | | | | | | | |
| Wiesen 201640 | Closed sticky mittens training | Contingent reinforcement to promote active engagement and exploration of objects  Perception-action-cognition linkage | i. Set of lightweight toys covered in velcro  ii. Soft fleece mittens with velcro soft side sewn on palm of mitten  iii. Printed instructions | i. Parents presented velcro covered toys within infants reach, one at a time  ii. Parents verbally encourage infant to contact the toy  iii. If the infant made a sticky contact with the ball, they were allowed to retain it for 10 seconds before placing it back on table  iv. Infant’s position: Seated on parent’s lap or supported seat | Parent-led Psyc. guided | In person/  1 on 1 | Home | Sessions:  10 sessions, over 2 weeks  Session Length:  10 minutes  Total time:  100 minutes | None | F: Not reported  C:✓  Training log |
|  | Non-sticky mittens observation training | Passive object exposure to toys | i. Set of lightweight toys covered with ribbon strip  ii. Soft fleece mittens with electrical tape on palm of mitten  iii. Printed instructions | i. Parents passively moved one toy at a time in front of the infant (same visual experience)  ii. Infant’s position: Seated on parent’s lap or supported seat | Parent-led Psyc. guided | Home | Sessions:  10 sessions, over 2 weeks  Session Length:  10 minutes  Total time:  100 minutes | None |
| Needham 2017 41 | Closed sticky mittens training | Contingent reinforcement to promote active engagement and exploration of objects  Perception-action-cognition linkage | i. Set of lightweight toys (plastic blocks/foam letters) covered in velcro  ii. Soft fleece mittens with velcro soft side sewn on palm of mitten | i. Parents demonstrated the sticky mechanism up to 3 times at the start.  ii. Infants were encouraged to reach for the blocks and self-explore.  iii. Parents were allowed to direct infant’s attention to blocks.  iv. Infant’s position: Seated on parent’s lap | Psyc. Led | In person/  1 on 1 | Research Lab | Sessions:  1 session, once  Session Length:  9-10 minutes  Total time:  9-10 minutes | None | Not applicable |
|  | Non-sticky mittens observation training | Passive object exposure to toys | i. Set of lightweight toys (plastic blocks/foam letters) covered with ribbon strip  ii. Soft fleece mittens with electrical tape on palm of mitten | i. Parents passively moved one toy at a time in front of the infant (same visual experience)  ii. Infant’s position: Seated on parent’s lap | Psyc. Led | Research Lab | Sessions:  1 session, once  Session Length:  9-10 minutes  Total time:  9-10 minutes | None |
| Nascimento 2019 42 | Open sticky mitten training | Contingent reinforcement to promote active engagement and exploration of objects  Haptic feedback for reaching and object exploration | i. Modified infant bobby sock mittens with open fingers  ii. 3 lightweight toys covered in velcro | i. Therapist passively demonstrated the sticky mitten mechanism at the start  ii. Simulated reaching and active reaching encouraged  iii. Infant position: on the researcher’s lap reclined approximately at 45° | Physical therapist | In person/  1 on 1 | Home | Sessions:  1 session, 6repetitions, once  Session Length:  4 minutes  Total time:  4 minutes | None | Not applicable |
|  | Social training |  | None | i. Therapist interacted with the infant verbally and visually  ii. Infant position: on the researcher’s lap reclined approximately at 45° | Physical therapist | Home | Sessions:  1 session, 6repetitions, once  Session Length:  4 minutes  Total time:  4 minutes | None |
| Heathcock 2008, 43  2009 44 | Contingent toys (Ribbon tethered toy, velcro mittens/socks and bells) + Movement training | Early intensive task-specific training facilitates skill development  Contingent reinforcement improves opportunities for exploration | i. Mittens and bells with velcro attached  ii. Ribbon attached to an auditory toy  iii. Printed instructions for training  iv. Activity log for compliance | i. 3 activities performed:  a) General movement:  Parent connected the auditory toy to infant’s wrist using ribbon. Any active movement of wrist was rewarded with toy movement and sound.  For kicking: Bells attached to infant’s socks made a sound every time infant contacted the toy with foot  b) Midline movement: Parent presented the toy in midline and assisted the infant to touch the toy at the start. Infant was then encouraged to actively perform midline movements using arms and legs. Velcro assisted mittens and toys were used to support this exploration.  c)Specific movement:  Parents used auditory toys to facilitate single joint and multi-joint reaching movements (elbow and knee isolation)  d) Infant position: Supine with parent positioned at infant’s feet | Parent-led Physical therapist guided | In person/  1 on 1  In person/  1 on 1 | Home | Reaching  Sessions:  40 sessions over 8 weeks  Session Length:  15 minutes  Total time:  600 minutes  Kicking  Sessions:  40 sessions over 8 weeks  Session Length:  10 minutes  Total time:  400 minutes | None | F: Weekly observation of training by therapist  C:✓  Training log |
|  | Social training | Social interaction with infant | 1. 10 minute CD of children’s music | i. Parents engaged with the infant visually and verbally  ii. Parents were not allowed to touch the infant or present toys  iii. Infant was allowed to move freely | Parent-led Physical therapist guided | Home | Reaching  Sessions:  40 sessions over 8 weeks  Session Length:  15 minutes  Total time:  600 minutes  Kicking  Sessions:  40 sessions over 8 weeks  Session Length:  10 minutes  Total time:  400 minutes  = | None |
| Needham 2014 45 | Contingent toy training (ribbon tethered mobile) | Contingent reinforcement to promote active engagement and exploration of objects | i. Kidney bean shaped table  ii. 2 standard microphone stands  iii. Brightly colored  wooden mobile (Beetles and Bees Wooden Ceiling Mobile by Handelshaus  G. Gollnest & F. R. Kiesel KG)  iv. Ribbon and a custom-made wristlet | i. A ribbon was used to connect the infant’s wrist to the mobile on one of the microphone stand  ii. Experimenter demonstrated the contingency mechanism by moving the infant’s hand 4 times at the start  iii. The infant was then allowed to actively explore the movement of the mobile  iv. Infant position: Supported sitting on parent’s lap | Psyc. Led | In person/  1 on 1 | Research Lab | Sessions:  1 session, once  Session Length:  9 minutes  Total time:  9 minutes | None | Not applicable |
|  | Non-contingent passive observation | Passive object exposure to toys | ii. 2 standard microphone stands  iv. Ribbon and a custom-made wristlet | i. A ribbon was used to connect the infant’s wrist to an empty microphone stand  ii. The experimenter manipulated the mobile. The number of manipulations was matched to that of experimental group but was not contingent on infant’s actions.  iii. Infant position: Supported sitting on parent’s lap | Psyc. Led | In person/  1 on 1 | Research Lab | Sessions:  1 session, once  Session Length:  9 minutes  Total time:  9 minutes | None |
| Campbell 2015 46 | Contingent toy (ribbon tethered overhead mobile) training | Incorporating contingency paradigm in a task-based functional intervention | i. Mobile with velcro tethers that could be attached to infant’s ankles | i. Parents could demonstrate the contingency mechanism by occasionally moving the infant’s legs to elicit visual and auditory response of the mobile  ii. Infants were allowed to self-explore the kicking mechanism  iii. Infant position: Reclined in infant bath seat  iv. Other types of early intervention continued | Parent-led Psyc. guided | In person/  1 on 1 | Home | Sessions:  40 sessions over 8 weeks  Session Length:  8 minutes  Total time:  3 20 minutes | Use of ankle sling tethered to the mobile to partially support the weight of infant’s legs | Not reported |
|  | Control (No training) | Not applicable (Could engage in early intervention- details not provided) | | | | | | | | |
| Williams 201647 | Contingent toys (colorful toys that sounded on hand-toy contact) training | Contingent reinforcement to promote active engagement and exploration of objects  Intersensory redundancy hypothesis (synchronous presentation of sound and motion in a task can increase the perception of the task in infants) | i. Modified small, colorful plastic spheres with a bell inside. These toys moved and sounded only upon hand-toy contact | i. Experimenter presented the contingent toy at midline (14 cm in front) of the infant  ii. No verbal cues were provided  iii. Infant position: seated in a custom-made infant reclined 10 degrees from the vertical | Psyc. Led | In person/  1 on 1  In person/  1 on 1 | Home | Sessions:  10 sessions, over 2 weeks  Session Length:  10 minutes  Total time:  100 minutes | None | Not reported |
| Non-contingent toy movement training | Non-contingent task exposure | i. Modified small, colorful plastic spheres with a bell inside. These toys sounded and moved for one full minute and then shut-off. The toy mechanism was not contingent on infant’s actions. | i. Experimenter presented the contingent toy at midline (14 cm in front) of the infant. The motor for the toy was switched on.  ii. No verbal cues were provided  iii. Infant position: seated in a custom-made infant reclined 10 degrees from the vertical | Psyc. Led | Home | Sessions:  10 sessions, over 2 weeks  Session Length:  10 minutes  Total time:  100 minutes | None |
| Control (No training) | Not applicable | | | | | | | | |

Abbreviations: Rx, Treatment; PAL, Pacifier-activated Lullaby; NICU, Neonatal Intensive Care Unit; NNS, Non Nutritive Sucking; F, fidelity (refers to the degree to which an intervention happened in the way the investigators intended it to and can affect the success of an intervention); C, Compliance (the extent to which the delivered intervention varied from the intended intervention), ✓, Completed; X; Not completed; F/U, Follow-Up.

For details on individual domains of TIDieR checklist refer: [https://www.equator-ne2rk.org/reporting-guidelines/tidier/](https://www.equator-network.org/reporting-guidelines/tidier/)