**Project working title: MannerPathPriming**

**Preregistration June 9, 2016**

**Authors: *Melissa Kline, Annelot de Rechteren van Hemert, Jesse Snedeker***

**Affiliation: *Jesse Snedeker***

This repository contains (so far) information relating to 3 related experiments, referred to throughout at MP-NoExtend, AE-Extend, and MP-Extend. MP-NoExtend was finished as of this preregistration – having made the plans for the second two experiments, we found ourselves in a great position to preregister analyses & methods for the next two studies. AE-Extend data collection has already begun, although at n significantly lower than our intended sample size (see methods). This is therefore a qualified preregistration of AE-Extend and a truer preregistration of MP-Extend.

**A. Hypotheses**

There are two domains, Change-of-state (CoS) and Motion (MOT). Within each domain, there is a pair of abstract perspectives/features of events: Action & Effect (AE) within CoS, and Manner & Path (MP) within MOT. We are asking (1) whether participants (4-5yo typically developing English speakers) can be trained to attend to one of these dimensions within a domain (e.g. either M or P within MOT) and (2) whether the training will extend across domains to the analogous perspectives (Manner & Action – both means of action - predicted to pattern together, Path & Effect – both outcomes of action - predicted to pattern together). Answers are always given as a forced-choice between two verb extensions, maintaining 1 of the 2 features in that domain (e.g. M vs P or A vs E).

MP-NoExtend (already conducted)

This study was designed to replicate Havasi Shafto & Snedeker (2013) Experiment 3, with new stimuli (designed along the same lines, but animated rather than live-action stimuli).

Hypothesis 1: Within the MOT domain, P’s trained to attend to Manner will give more Manner answers than those trained to attend to Path.

This hypothesis was loosely supported by E1: there was a trend in the correct direction with an apparent effect size in line with previous findings, but result not significant and the study was severely underpowered. (See Analysis/MPP\_Analysis.R for all calculations)

AE-Extend (Referred to as E2 in the data sheets)

Hypothesis 2: Within the CoS domain, P’s trained to attend to Action will give more Action answers than Ps trained to attend to Effect.

Hypothesis 3: In phase 2, within the MOT domain, P’s trained to attend to Action will go on to give more Manner answers than P’s trained to attend to Effect.

MP-Extend (Planned, will be E3 in the data sheets)

Hypothesis 4: Within the MOT domain, P’s trained to attend to Manner will give more Manner answers than those trained to attend to Path. (Identical to Hypothesis 1 because the 1st phase of MP-Extend is identical to MP-NoExtend!)

Hypothesis 5: In phase 2, within the CoS domain, P’s trained to attend to Manner will go on to give more Action answers than P’s trained to attend to Path.

Manipulation Checks

All experiments are structured as a series of verbs which are presented and then learned. We are actually interested in the guesses made on **presentation** (ie whether they are affected by learning/exposure to *previous* verbs). However, successful learning of the individual verbs (ie. above-chance performance on selecting the trained answer at the *end of* each verb trial) can serve as a manipulation check that Ps are learning something during the experiment.

Alternate Hypotheses

Previous research and our own experiment so far suggest that 4-5yos are able to generalize within domain – they can learn to generalize from exemplars of paths (e.g. crossing, entering, ascending) to an abstract category of Path, measured by an expectation that a new verb will also refer to the manner of motion (i.e. descending, not skipping.) If this is in fact the case, we expect Hypotheses 2 and 4 to be supported. If the previous results are misleading, we expect to find no differences of training on meaning selection in either experiment.

The next question is whether the categories children learn are domain specific, or if, like adults (Geojo, 2015), they extend them to very different verbs. If they do, we expect H3 and H5 to be supported. However, if children’s categories are abstract but also narrower than adults, we would see H2 and H4 confirmed, but find no differences of training in the second phase (i.e. no difference in conditions for H3 and H5).

**B. Methods**

**Design**

Independent variables

AE-Extend: Training condition (A or E) between-subjects

MP-NoExtend and MP-Extend: Training condition (M or P) between-subjects

Dependent variables

AE-Extend: Binary choice of A-generalizing movie or E-generalizing movie on the bias phase question of verbs 2-8; Binary choice of M-generalizing or P-generalizing movie on verbs 9-16

MP-NoExtend/MP-Extend: Binary choice of M or P generalizing movie on the bias phase question of verbs 2-8; Binary choice of A-generalizing or E-generalizing movie on verbs 9-16

No covariates or moderators

Planned sample

Data will be collected from 4-5yos recruited in Snedeker lab in the usual way.

Details of power analysis are in MPP\_Analysis.R

We used MP-NoExtend to calculate an estimate of the effect size (we have no a priori reason to believe effect size will differ across MP and AE domains.) Both MP-NoExtend and Havasi et al. 2013 (on which it was based) are quite underpowered (16/cell).

We know ourselves to be very underpowered; we don’t have the resources to test the recommended 99/cell, so we will have to hope our estimate of effect size is low. The planned sample size is 32/cell, with an option to extend to 64/cell if results are trending but not conclusive.

Exclusion criteria

Participants will be included so long as they are able to complete the task, we will not attempt to make judgments about whether the child was paying sufficient attention on a given trial. Verb learning (i.e. responses at *test* phase) will serve as a manipulation check at the group level, but we will not use it as a screener for individual inclusion. Decisions to exclude data from analysis will be made at the subject level by MK, as soon as possible after testing and prior to seeing the data from that participant (if MK ran the participant, JS or another lab member will make the judgment), though see below for cases where this judgment may be applied later.

Three conditions warrant exclusion from analysis: accidentally recruited a participant outside our intended sample (e.g. significant developmental delay reported during the session), the child refuses to give answers or otherwise participate in the whole study, the experimenter makes an error that gives the child information about either the novel verb or the movies they are seeing, or the parent/guardian give the child information about the novel verb/which movie to pick. (Parents are asked not to help during the task introduction).

Procedure

The stimuli, script used by the experimenter during the task and the actual code used to present stimuli, including all randomization and counterbalancing, are available in the repository.

Repository/Docs & Info for running/MannerPath\_script.txt

Repository/MPP\_Stim\_and\_Data/MPP.m (Matlab script)

Experimenters are not blind to condition because they must be present in the room to help the child understand the pointing task. To check for fidelity and possible experimenter cueing, we video-record all sessions and will have a blind-to-condition coder (accomplished by putting post-its over the part of the screen showing the laptop that presented the stimuli) rate 10% of the participants’ videos for (1) child ‘checking in’ with the experimenter and (2) experimenter showing a preference for one video before the childs’ choice. If we discover possible cueing problems, we will then blind code the remainder of the sessions and exclude/replace data from sessions with cueing problems.

**C. Analysis plan**

**Confirmatory analyses**

Our planned confirmatory analyses are all included (though not all are implemented) in Analysis/MPP\_Analysis.R

To summarize, we have one between-participants variable, Condition; participants give 7 binary responses in Phase 1 and 8 binary responses in Phase 2 (A/E or M/P). We will use mixed-effects logistic regression with random effects of items in two models. First, we can ask whether Condition affects the choices participants made (ie. whether training caused them to make more M choices rather than P choices), and second we will ask if there is an effect of the trial number; that is whether differences increase over time.

Missing data is handled automatically by this method because we enter individual responses rather than scores into the regression – a child might not have an observation at trial 6, but that’s ok.

We do not plan to do any data transformations other than calculating ‘average correct’ scores based on the responses children give at the *end* of each trial. To try and deal with our low power this score will provide a secondary way to select a subset of participants who are especially attentive/on the ball and see if the expected effects described above hold in this group.

These analyses assume only (?) that the binary data will not turn out to be totally at floor/ceiling, which based on pilot data is very very unlikely to happen!

**Answer the following final questions:**

Has data collection begun for this project?

* Yes, data collection is underway. In the MPP\_Data.csv spreadsheet, E1 represents the initial study (MP-NoExtend) that was used to calculate effect size estimates, and E2 represents the ongoing AE-Extend study (described above) which is the 1st of the two preregistered experiments begun here.

If data collection has begun, have you looked at the data?

* Yes. During MP-NoExtend (replication of Havasi, Shafto & Snedeker 2013) we realized that larger sample sizes than expected would be needed, so we decided to move directly to the longer and more interesting ‘extension’ studies rather than beginning with the within-domain version. We therefore developed the code for the extension version and began testing children on the new version as soon as we could (interleaved with collecting the rest of the informally planned 32 total MP-NoExtend participants). There were no designated ‘pilot’ participants for the beginning of AE-Extend, but there were several participants who did not complete the study because of bugs in our code.
* Because the effect size was smaller than expected, we knew that the intended subject size for AE-Extend would be larger than 32 at least. Power analysis and ‘pre’registration were not conducted until after subject 19 was collected, thanks to the researchers (MK) not getting to it until then (she acknowledges that this is not a good reason).
* The planned analyses were decided on during the MP-NoExtend pilot phase and after ~12 AE-Extend participants had been run. We did not try any additional models because the glmer with max. random effects -> anova comparsion of models is a standard analysis formula I am using at this point. We can now preregister, though, that we intend to continue using this method of analysis for AE-Extend and MP-Extend
* Because of these issues, MK would consider this preregistration to certify against analysis/garden-of-forking-path issues, but it does NOT qualify as a preregistration preventing the ‘file drawer’ problem, because we already have some indications that AE-Extend is panning out the way we expected, and can’t certify we’d be doing this preregistration in the alternate world where that wasn’t the case.

The (estimated) start and end dates for this project are: Aiming to finish data collection by the end of Summer 2016