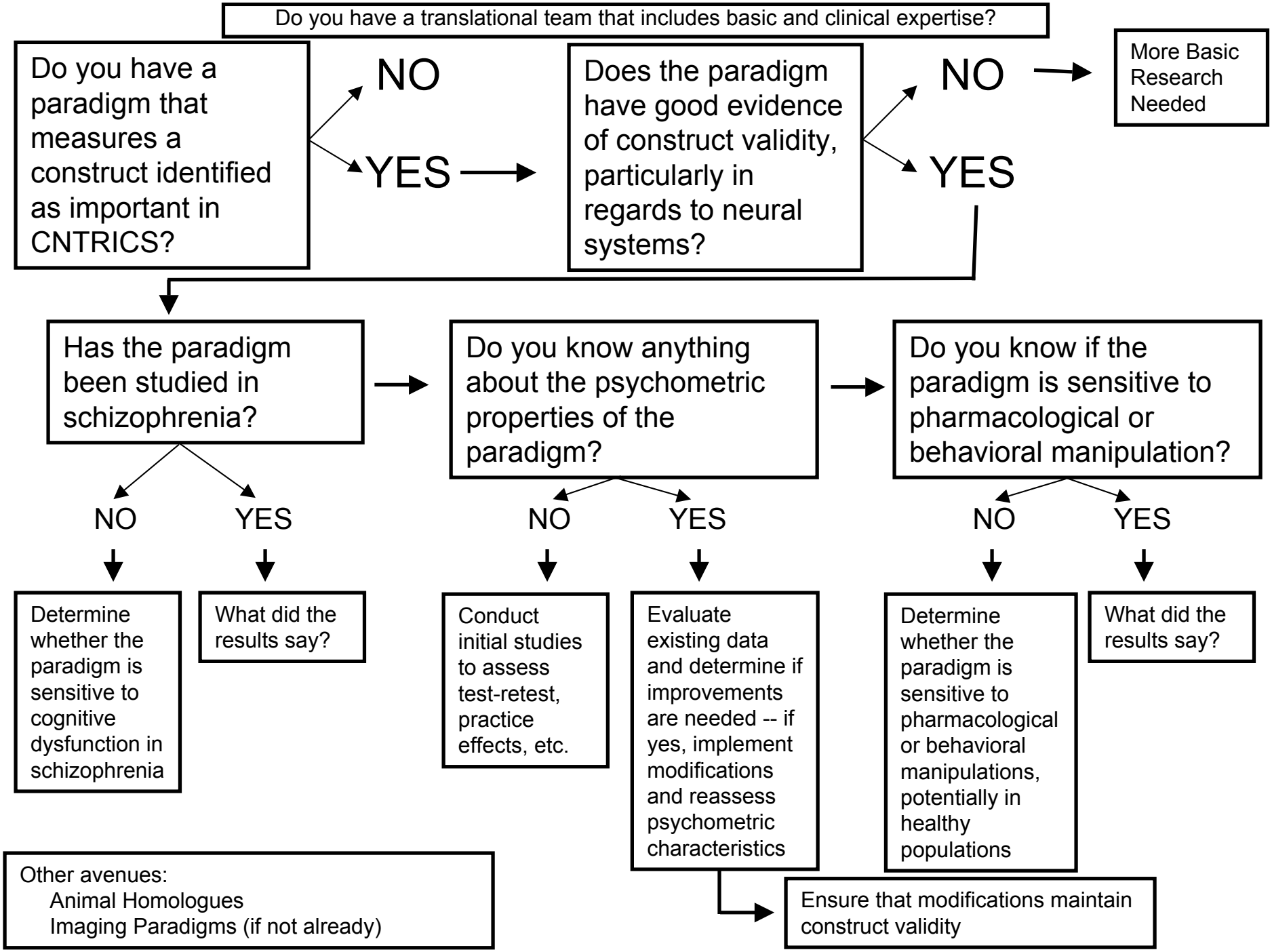
Executive Control:
Breakout Group Summary

Criteria

- **<u>Strong construct validity as a measure of the targeted cognitive construct</u>**
- **Clarity of the link to a specific neural circuit**
- **Clarity of the understanding of the cognitive system or mechanisms**
- **Availability of an explicit animal model**
- **Linked to neural systems through neuropsychopharmacology**
- **Practically amenable for use in human neuroimaging studies**
- **Strong evidence of impairment in schizophrenia:** Many nominated tasks may not have been studied in schizophrenia. Empirical evidence that a task elicits deficits in schizophrenia is not necessary if the task has good construct validity as a measure of one of the cognitive processes identified in the first CNTRICS meeting as being relevant to understanding the pathophysiology of schizophrenia. However, all else being equal, positive evidence that the task elicits deficits in schizophrenia, particularly if the design of the task allows a differential deficit interpretation, should be considered an advantage for a task.
- **Linked to functional outcome in schizophrenia:** The absence of evidence about links to functional outcome in schizophrenia should not be used to exclude tasks from consideration, as part of the goal of CNTRICS is to facilitate examination of such relationships in future research. However, all else being equal, positive evidence for a link to functional outcome in schizophrenia should be considered an advantage for a task.
- **Good psychometric properties:** The absence of evidence about psychometric characteristics such as test-retest reliability, practice effects, and floor-ceiling effects should not be used to exclude tasks from consideration, as part of the goal of CNTRICS is to facilities examination of such properties in future research. However, all else being equal, positive evidence for such characteristics should be considered an advantage for a task.


Do you have a translational team that includes basic and clinical expertise?
Do you have a paradigm that measures a construct identified as important in CNTRICS?
NO
YES
Does the paradigm have good evidence of construct validity, particularly in regards to neural systems?
NO
More Basic Research Needed
YES
Has the paradigm been studied in schizophrenia?
NO
YES
Determine whether the paradigm is sensitive to cognitive dysfunction in schizophrenia
What did the results say?
Do you know anything about the psychometric properties of the paradigm?
NO
YES
Conduct initial studies to assess test-retest, practice effects, etc.
Evaluate existing data and determine if improvements are needed -- if yes, implement modifications and reassess psychometric characteristics
Do you know if the paradigm is sensitive to pharmacological or behavioral manipulation?
NO
YES
Determine whether the paradigm is sensitive to pharmacological or behavioral manipulations, potentially in healthy populations
What did the results say?
Ensure that modifications maintain construct validity
Other avenues:
Animal Homologues
Imaging Paradigms (if not already)

Dynamic Adjustments of Control:

- **Construct Definition:** The processes involved in detecting the occurrence of conflict or errors in ongoing processing, identifying the type of control adjustments needed, and recruiting additional control processes.
- **Construct Validity:** Involves establishment of sequential conflict -> control adjustment (conflict adaptation effect); not merely presence of conflict/interference per se
- **Nominated Tasks:**
    - ***Stop Signal Task: Selected***
    - ***Stroop Task: Selected***
    - *Attention Networks Task (FLANKER?)*
        - *Only flanker component is central to construct*
        - *Very similar in mechanism (identical?) to Stroop/Simon*
        - *Effects are not as robust or as frequently studied as Stroop*
            - » *ACC-DLPFC circuit not yet established for sequential effect*
    - *Simon Task*
        - *Very similar in mechanism (identical?) to Stroop/Simon*
        - *Effects are not as large (but maybe more robust??) or as frequently studied as Stroop*

Stroop Task

- Strengths:
  - High construct validity: Robust interference and conflict adaptation effects
    - The most robust way of inducing such effects (or not? Simon task)
  - Computational underpinnings & cognitive mechanisms understood
    - Could be exploited more!!
  - Neural circuitry is well-established: ACC-DLPFC (Kerns et al., 2004)
  - Some evidence of deficits in schizophrenia
    - Clear evidence of interference changes; adaptation effect less well-established
  - Some animal model work for interference (but not adaptation effect)
  - Some psychopharmacology (but not well-established for adaptation)

Stroop Task

- Further Work Needed:
  - Animal model of adaptation effects: Are they possible?
  - Psychometrics of adaptation effect: Not yet established
    - How to optimize paradigm?
    - Combining tasks: Stroop, Flankers & Simon very similar (Imaging Meta-Analyses)
      - Latent variable approach?
  - More study in Schizophrenia
    - How robust are deficits -- how specific?
    - Links to functional outcome?
  - More psychopharmacology --> specifically targeted to adaptation effect

Stop-Signal Task

- Strengths:
  - Very strong link to animal model: Lots of work in both rodent & primate
  - Lots of psychopharmacology (but not as well-established for adaptation)
  - Neural circuitry is very well-established: May be distinct from Stroop
    - Right inferior PFC; STN (as well as MFC/ACC)
    - Single-cell data provide alternate neural targets for intervention
  - Computational underpinnings & cognitive mechanisms understood
    - Could be exploited more!!
  - High construct validity: Robust and precisely controlled effects
    - Conflict adaptation effect not as well studied as Stroop -> may be distinct; within-trial as well as across trial
  - Some evidence of deficits in schizophrenia
    - Effects not as clear with regard to monitoring / adaptation effects

Stop-Signal Task

- Further Work Needed:
  - More investigation of monitoring/adaptation process
  - Psychometrics of effect: Some aspects not established for clinical purposes
  - More study in Schizophrenia
    - How robust are deficits -- how specific?
    - Links to functional outcome?
  - More psychopharmacology --> specifically targeted to monitoring/adaptation effect

Rule Generation and Selection:

- **Construct Definition:** The processes involved in activating task related goals or rules based on endogenous or exogenous cues, actively representing them in a highly accessible form, and maintaining this information over an interval during which that information is needed to bias and constrain attention and response selection.
- **Construct Validity:** A focus of selection & updating of goals/rules/task-sets rather than on maintenance component (overlap with goal maintenance). Potential focus on the generation (induction) rules
- **Nominated Tasks:**
  - ***Switching Stroop: Selected***
  - ***ID-ED Task: Selected*** *(Not originally on the list)*
  - *1-2 AX-CPT*
    - *Lots of excitement, but too new; No published experimental data*
  - *Groton Maze Learning Test (GMLT)*
    - Construct validity -> measures rule following, trial-and-error learning, but not rule generation, selection and updating

Task-Switching Stroop

- Strengths:
  - High construct validity: Part of a class of cued task-switching paradigms
    - Strong cognitive experimental database: Task-set representation can be dissociated from activation of specific S-R associations
    - Cueing effect is robust -> preparatory benefits of task-set selection
    - But, potentially some important differences between Switching Stroop vs. other Cued Task-switching paradigms (task asymmetries)
  - Evidence of deficits in schizophrenia (Cohen et al., 1999)
    - Are linked to goal maintenance deficits
  - Computational underpinnings & cognitive mechanisms understood
    - A number of good models
  - Neural circuitry reasonably well-established: DL-PFC (MacDonald et al, 2000)
    - There may be distinction between cue-related activation of task-sets vs. updating to new task-set

Task-Switching Stroop

- Further Work Needed:
  - More investigation in schizophrenia:
    - Specific effects of task difficulty asymmetry
    - Specific effects of task-cuing (preparatory effects) vs. task updating (switch-cost effects)
    - Functional outcomes?
  - Some animal work in primates, but not much
    - Can this even be done in rodents?
  - Psychometrics of effect
    - Very little data
  - Psychopharmacology
    - No data

ID/ED

- Strengths:
  - High construct validity: Paradigm developed to get at this construct!
    - Componential measures: Can dissociate rule selection & updating from other processes
    - Also gets at rule generation -- potentially an important aspect of construct not tapped by other measures
    - Large empirical database behind it
  - Very strong links to animal model
  - Neural circuitry well-established
    - Great deal of data in animals (ventral/orbital vs. dorsal PFC; some human neuroimaging)
  - Good evidence of deficits in schizophrenia
    - Psychometrics have been explored

- Further work needed:
  - Psychometrics needs further development, improvement
  - Links to functional outcome in schizophrenia
    - WCST data available, but similarity/differences vs. ID/ED not really known