



# Beyond Dashboards:

Evidence-Based Audit and Feedback Design

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Baylor College of Medicine



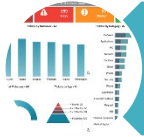
# Today's Objectives

- Provide an overview of the theory and science behind effective audit and feedback design,
- Present key contextual factors driving feedback effectiveness, and
- Recommendations for optimizing the design of audit and feedback to improve quality of care

# Poll: What brings you here today?



I am a consumer of audit and feedback



I deliver audit and feedback and want to learn to do it better



I want to use audit and feedback as an implementation strategy

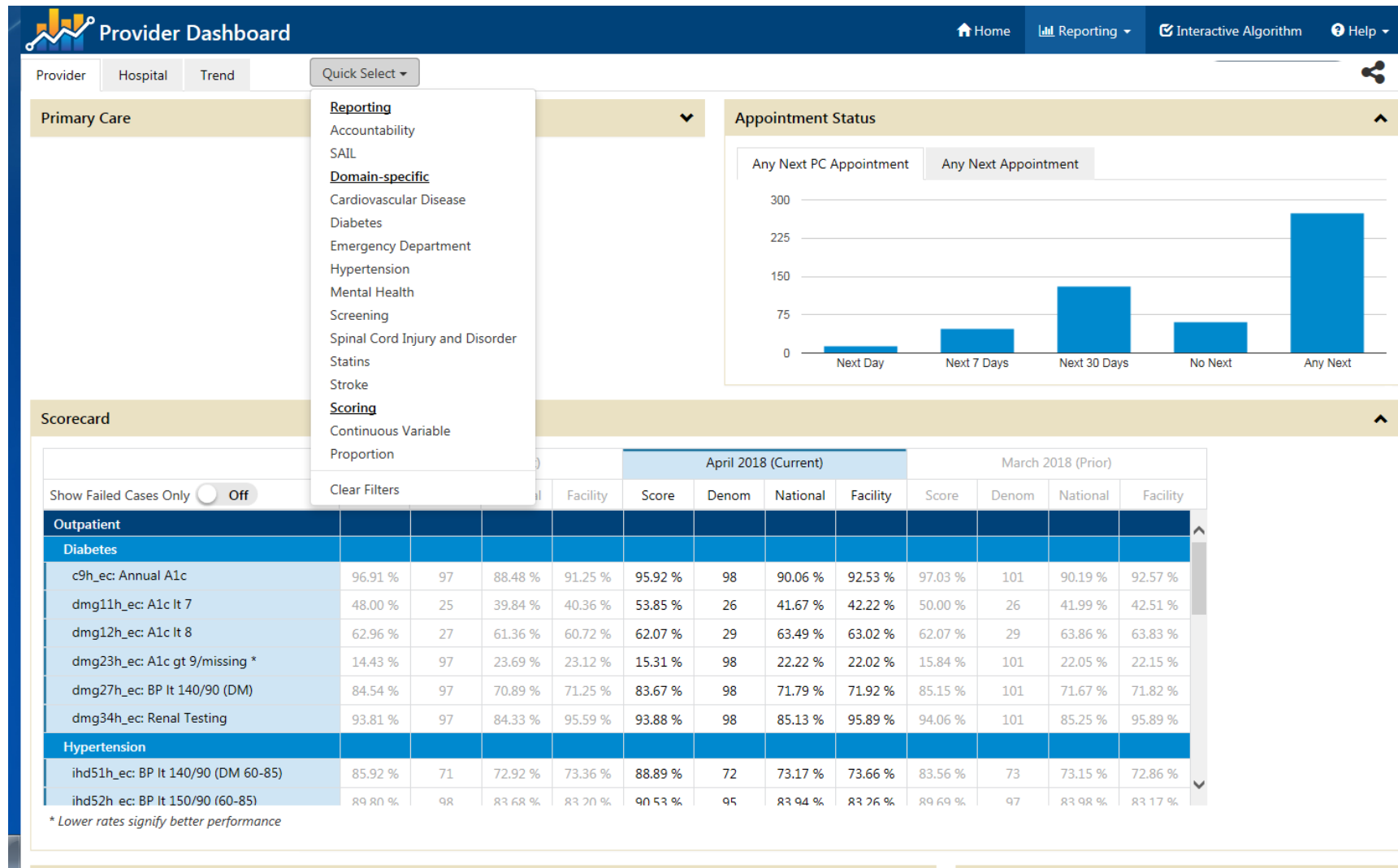


I want to study audit and feedback



What's audit and feedback?

# A typical example of a dashboard





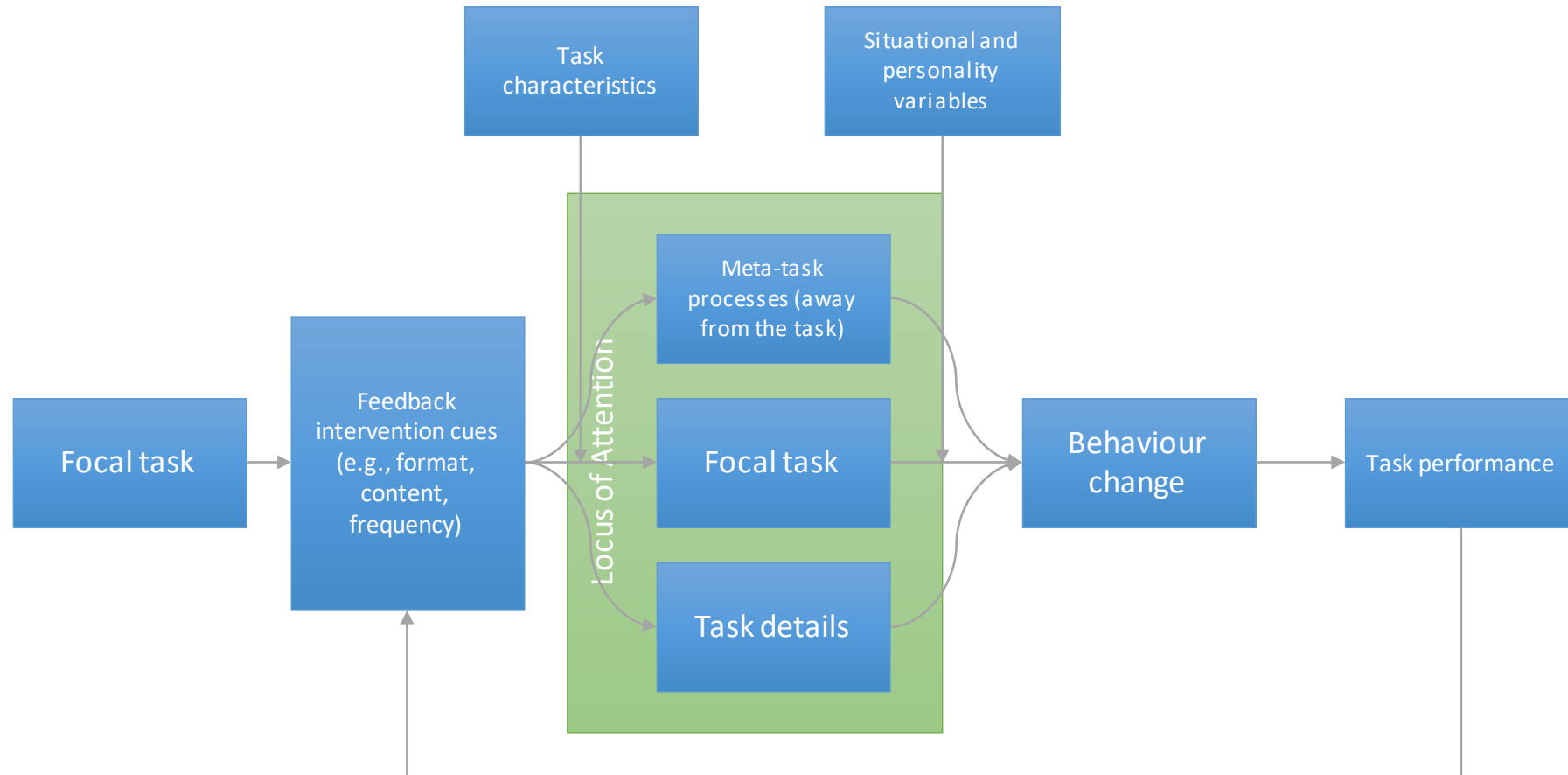
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# Theories of Feedback

25 Years of Evolution

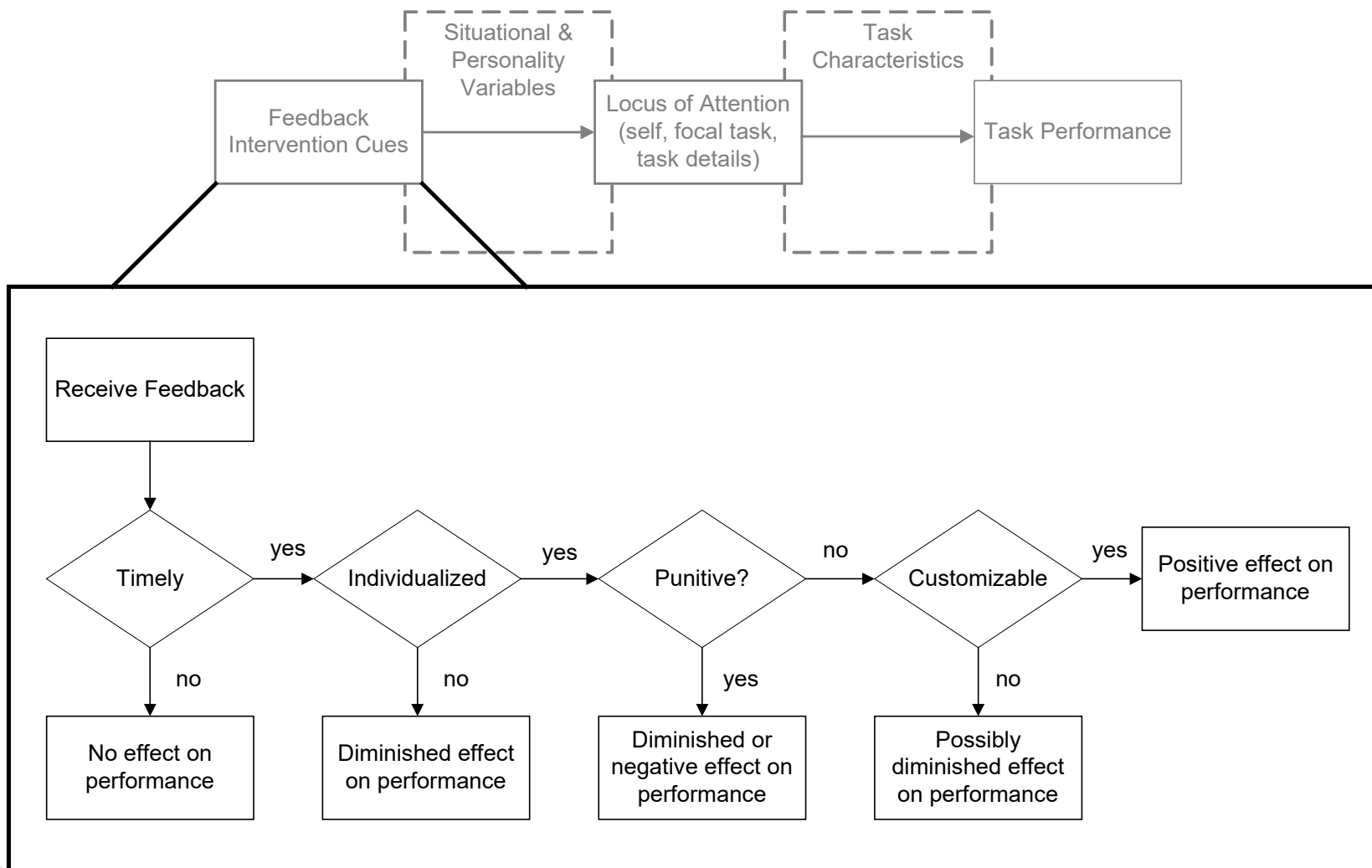
# The Classic: Feedback Intervention Theory

Kluger & DeNisi, 1996



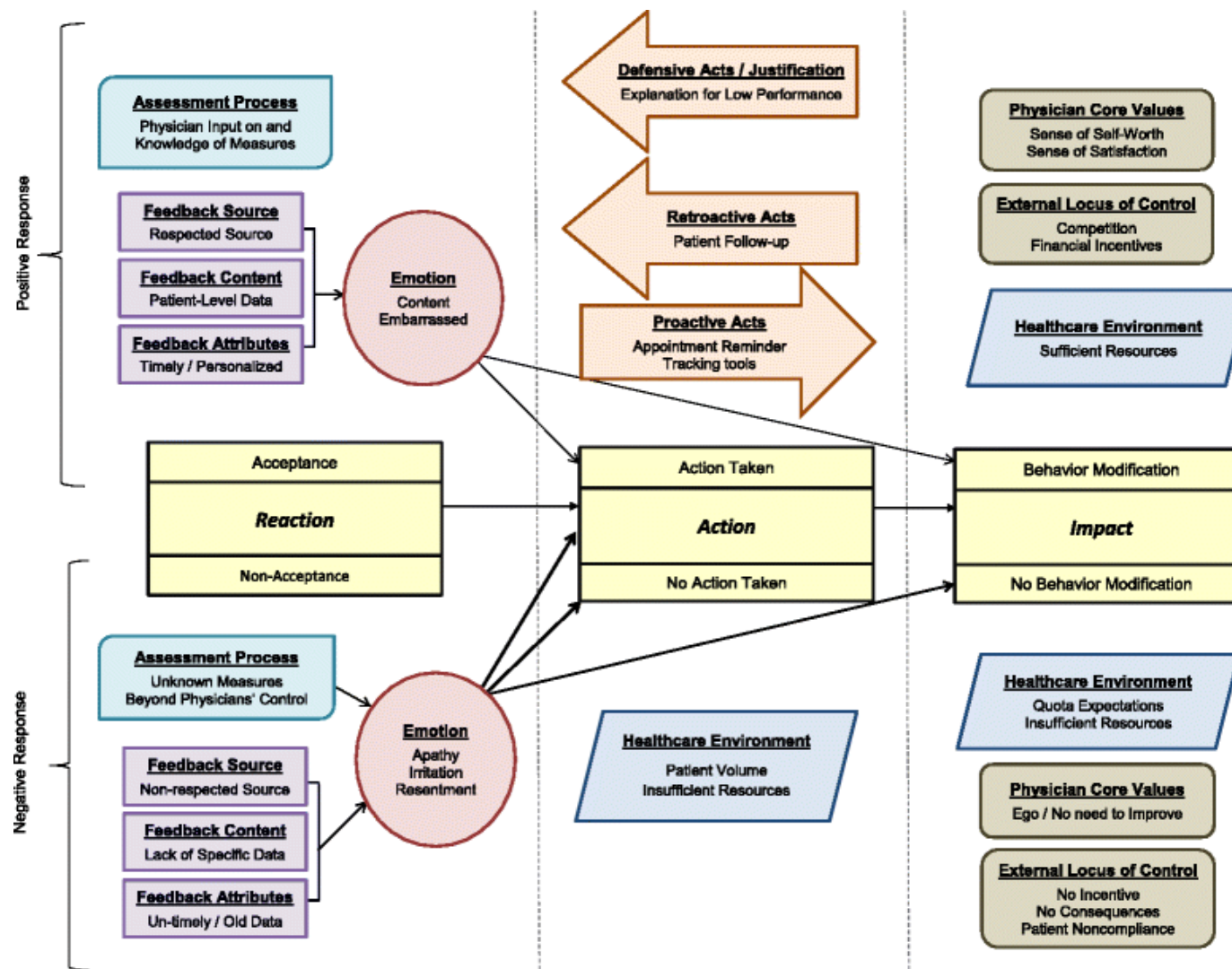
# The Classic Expanded: A Model of Actionable Feedback

Hysong et al., 2006



# The Classic Expanded: Reactions to Feedback

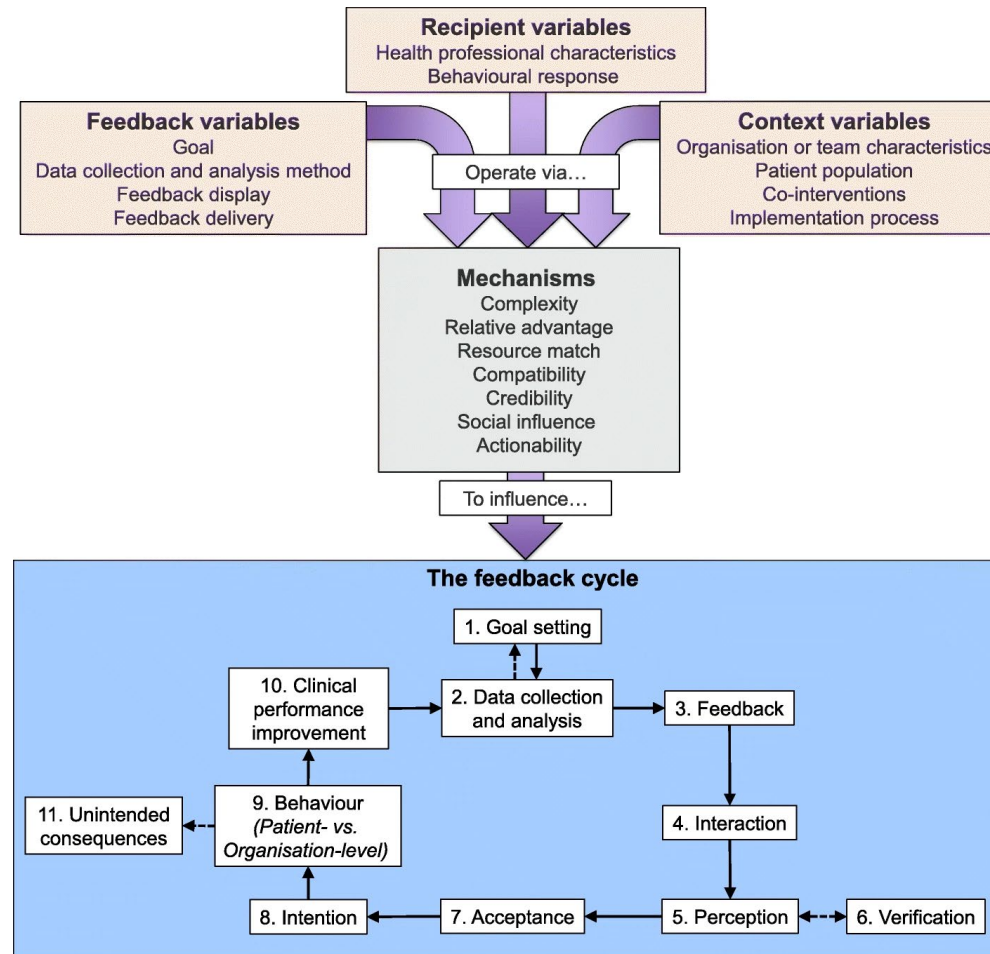
Payne and Hysong, 2016





# Today: Clinical Performance Feedback Intervention Theory

Brown et al., 2019





# Using Feedback More Effectively: Theory-Informed Empirical Research

# The Classic: Features that Make Feedback More Effective

Kluger & DeNisi, 1996

Feedback characteristics

Task characteristics

Situational variables

Personality variables

Table 2  
*Feedback Intervention (FI) Effects by Levels of Significant FI Moderators After All Exclusions*

Moderator	K	$\bar{d}$	$\sigma_d$
Correct solution (P2)			
Yes	114	.43	.38
No	197	.25	.44
Velocity (P2)			
Yes	50	.55	.46
No	380	.28	.40
Discouraging FI (P1)			
Yes	49	-.14	.52
No	388	.33	.37
Praise (P1)			
Yes	80	.09	.38
No	358	.34	.39
Verbal FI (P1)			
Yes	194	.23	.40
No	221	.37	.42
Computer FI (P2)			
Yes	87	.41	.40
No	337	.23	.42
FI frequency			
Top quartile	97	.32	.31
Bottom quartile	171	.39	.34
Task complexity (P3)			
Top quartile	107	.03	.46
Bottom quartile	114	.55	.39
Physical task			
Yes	65	-.11	.39
No	378	.36	.38
Memory task			
Yes	43	.69	.54
No	357	.30	.39
Following rules			
Yes	100	.19	.52
No	320	.36	.37
Goal setting (P4)			
Yes	37	.51	.40
No	373	.30	.45
Threat to self-esteem (P1)			
Top quartile	102	.08	.30
Bottom quartile	170	.47	.48

# Adapting the Classic to the Healthcare Context

Hysong, 2009

**TABLE 2.** Summary of Subgroup Analyses for Feedback Characteristics and Meta-Regression of Feedback Frequency on Effect Size

Moderator	No. Studies	Effect Size*	95% CI	
			LCL	UCL
<b>Correct solution information</b>				
Yes†	6	0.78 <sup>a</sup>	0.55	10.00
No†	12	0.23 <sup>b</sup>	0.11	0.34
Not reported†	1	0.30 <sup>b</sup>	0.11	0.48
<b>Feedback delivered graphically</b>				
Yes	4	0.13 <sup>a</sup>	-0.05	0.31
No†	11	0.66 <sup>b</sup>	0.51	0.81
Not reported	4	0.14 <sup>a</sup>	-0.003	0.29
<b>Feedback delivered in writing</b>				
Yes†	14	0.49 <sup>a</sup>	0.38	0.60
No	3	0.10 <sup>b</sup>	-0.07	0.26
Not reported	2	-0.21 <sup>b</sup>	-0.58	0.16
<b>Feedback delivered verbally</b>				
Yes	5	0.10 <sup>a</sup>	-0.09	0.29
No†	11	0.41 <sup>b</sup>	0.30	0.51
Not reported	3	0.25 <sup>ab</sup>	-0.06	0.57
<b>Group vs. individual feedback</b>				
Individual only†	9	0.31	0.19	0.42
Group only†	7	0.34	0.19	0.49
Group and individual†	2	0.96	0.40	10.52
Not reported	1	0.07	-0.73	0.87
<b>Feedback delivered publicly</b>				
Yes†	5	0.26	0.13	0.39
No†	12	0.38	0.25	0.50
Not reported†	2	0.78	0.21	10.35
<b>Normative information</b>				
Yes†	8	0.32	0.19	0.46
No†	9	0.37	0.21	0.54
Not reported†	2	0.28	0.11	0.47
<b>Feedback frequency</b>				
Slope†	B†	SE	LCL	UCL
	0.07†	0.03	0.009	0.13
Intercept†	0.28 <sup>b</sup>	0.05	0.18	0.38

Table 2

*Feedback Intervention (FI) Effects by Levels of Significant FI Moderators After All Exclusions*

Moderator	K	$\bar{d}$	$\sigma_d$
<b>Correct solution (P2)</b>			
Yes	114	.43	.38
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# What else does the evidence say about feedback design?

- **Frequency:** Give feedback frequently, but not too frequently ([Lam et al., 2011](#))
- **Timeliness:** Feedback should be timely, but encourage comparison across multiple time periods (Lurie & Swaminathan, 2009)
- **Content:** Providing correct solution information makes feedback more effective (Hysong, 2009)
- **Customizability:** Feedback interventions should be customized (Hysong et al. 2006; Anseel et al. 2011, Chen & Mathieu 2008)
- **Individual Characteristics:** Take into account the characteristics of the feedback recipient (e.g., the lower your competence, the more likely to dismiss negative feedback (Sheldon et al. 2014)

# Practice Feedback Interventions: 15 Suggestions for Optimizing Effectiveness

Brehaut et al. 2016

## Nature of Desired Action

- 1. Recommend actions that are consistent with established goals and priorities
- 2a. Recommend actions that have room to improve for the recipient
- 2b. Recommend actions that are under the control of the recipient
- 3. Recommend specific actions

## Nature of Available Data

- 4. Provide multiple instances of feedback
- 5. Provide feedback as soon as possible and at a frequency informed by the number of new patient cases (or opportunities to enact the behavior)
- 6. Provide individual rather than general data
- 7. Choose comparators that reinforce the desired behavior change

## Feedback Display

- 8. Closely link the visual display and summary message
- 9. Provide feedback in more than one way
- 10. Minimize extraneous load for feedback recipients

## Feedback Delivery

- 11. Address barriers to using/engaging with the feedback itself
- 12. Provide short, actionable messages followed by optional detail
- 13. Address credibility of the information
- 14. Prevent defensive reactions to feedback
- 15. Construct feedback through social interaction



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# Making Informed A&F Design Choices

aka "Ok... So how does theory help me?"

# How theory and evidence can help inform design choices

NARRATIVE REVIEW

## Theory-based and evidence-based design of audit and feedback programmes: examples from two clinical intervention studies

Sylvia J Hysong,<sup>1,2</sup> Harrison J Kell,<sup>3</sup> Laura A Petersen,<sup>1,2</sup>  
Bryan A Campbell,<sup>4</sup> Barbara W Trautner<sup>1,2</sup>

► Additional material is published online only. To view please visit the journal online

### ABSTRACT

**Background** Audit and feedback (A&F) is a

both cases interventions were received positively by feedback recipients.



# How theory can help inform design choices

**Table 2** Operationalisation of feedback design characteristics Case 1

Feedback characteristic	Operationalisation in Case 1
Feedback characteristics—content	
Sign of feedback intervention (FI)	Variable
Correct–incorrect	Highlighted decision tree in PowerPoint presentation, showing physicians’ choices at each decision point, and interactive hyperlinks revealing whether each choice was or was not guidelines compliant
Correct solution	<ol style="list-style-type: none"> <li>1. <i>Indirect information</i>: Everyone received copy of guideline algorithm reflecting evidence-based decision-making rules for differentiating between CAUTI and ASB</li> <li>2. <i>Direct Information</i>: Highlighted decision path in PowerPoint presentation, with interactive hyperlinks providing rationale at each decision point</li> </ol>
Velocity	Not applicable—feedback was given for each individual case, so attainment scores could not be computed
Attainment level	Not directly applicable—feedback was given for each individual case, so attainment scores could not be computed
Normative information	Not used—focus was on the individual’s decision-making process
Norms	Not used—focus was on the individual’s decision-making process
Discouraging FI	Not used—per FIT recommendations
Praise	Not used—per FIT recommendations
Feedback characteristics—format	
Verbal FI	Verbal walkthrough of PowerPoint presentation by trained research assistant, using a written script
Written FI	Script used by research assistant was given to participants to keep
Both verbal and written	See verbal FI and written FI for components
Graphical FI	Highlighted decision tree in PowerPoint presentation, showing physicians’ choices at each decision point
Computer FI	Interactive PowerPoint presentation
Public FI	Not used—per FIT recommendations
Group FI	Not used—per FIT recommendations
Individual FI	Each PowerPoint presentation tailored to each participant was about a specific clinical case they treated
Group + individual FI	Not applicable—groups were not subjects of interest

Source: Hysong et al., 2016

# Case Example: A&F to Decrease Inappropriate Prescribing for ABU

Nature of Desired Action	Specific actions	Decrease inappropriate urine culture and Rx for ABU
	Actions can improve and under recipient's control	Diagnosis, test orders, prescription orders
	Consistent with goals and priorities	Consistent with IDSA guidelines
Nature of Available data	Timely and at a frequency informed b n of new pts	Feedback delivered no less than monthly
	Individual level data	Individualized case feedback
	Multiple instances of feedback	Multiple cases, delivered over course of a year
	Comparators reinforce desired behavior	Compare clinician decisions to IDSA algorithm
Feedback Display	Link visual and summary message	Interactive PPT linking individual behaviors to IDSA algorithm and correct solution info
	Multiple formats of feedback	Interactive ppt. highlights correct pathway
	Minimize extraneous cognitive load	Educational session on IDSA guideline; study PI as champion
Delivering the Feedback Intervention	Address barriers to FB use	Correct solution info provided IDSA guideline details
	Short actionable messages /optional detail	Study PI as champion highly respected in CAUTI field
	Source credibility	Standardized script for feedback
	Prevent defensive reactions	No built-in design features
	FB through social interaction	



# Where to Next?

# Feedback to Teams

- Who should receive feedback in a team?
  - Oftentimes only the physician has access to feedback dashboards
  - Existing dashboards and feedback tools often work best when given to non-physician team members (Hysong et al., 2014)
  - The entire team need not receive every piece of feedback all the time. But consistent debriefing among team members is critical to effective team feedback (Hysong et al. 2021)

At what level of aggregation should you provide feedback?

- Giving individual goals to members of a team decreases team performance (Mitchell & Silver, 1990; Walton & Gilbert, 2022)
- “Groupcentric goals” (individual goals focusing on contributions to team performance) combined with (Crowne and Rosse, 1995)
- Team members perform to whichever level (team vs. individual) they receive the most and highest-quality feedback (DeShon et al., 2004)





# Feedback Recipient Characteristics

- Feedback-seeking behavior (Anseel et al., 2015)
  - We can encourage feedback seeking behavior by making clear the value of feedback
  - Small relationship with performance
- Goal Orientation
  - Mastery orientation – preference for task-referenced feedback
  - Performance-approach orientation – preference for normative feedback
  - Performance-avoidance
- Individual characteristics can change over time



# Feedback Climate

A supportive feedback climate positively predicts employee performance and outcomes (Anseel & Lievens 2007; Rosen et al. 2006)

Factors that help foster a supportive feedback environment:

- Source credibility
- Source availability
- Consideration
- Feedback quality
- Frequency of positive feedback
- Frequency of negative feedback
- Feedback-seeking encouragement
- **Time for high quality reflection**



# Takeaways

- Feedback, when designed and implemented correctly, can be a powerful tool for behavior change and quality improvement
- For feedback to succeed, we must consider:
  - Characteristics of the feedback intervention
  - The nature of the task involved
  - Orientation of the feedback recipient
  - The environment (climate) of feedback
- Theory and research can help design specific feedback interventions to optimize success
- We still have a lot to learn about how best to use this powerful tool to its best advantage!



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# References

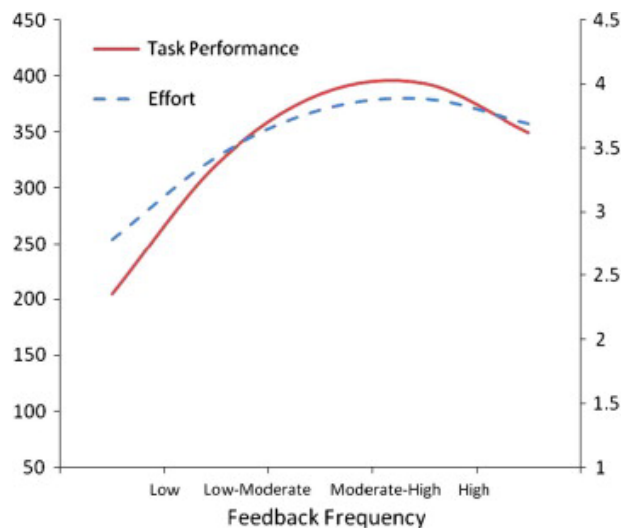
- Anseel, F., & Lievens, F. (2007). The long-term impact of the feedback environment on job satisfaction: A field study in a Belgian context. *Applied Psychology, 56*(2), 254-266.
- Anseel, F., Beatty, A. S., Shen, W., Lievens, F., & Sackett, P. R. (2015). How are we doing after 30 years? A meta-analytic review of the antecedents and outcomes of feedback-seeking behavior. *Journal of Management, 41*(1), 318-348.
- Anseel, F., Van Yperen, N. W., Janssen, O., & Duyck, W. (2011). Feedback type as a moderator of the relationship between achievement goals and feedback reactions. *Journal of Occupational and Organizational Psychology, 84*(4), 703-722.
- Brehaut, J. C., Colquhoun, H. L., Eva, K. W., Carroll, K., Sales, A., Michie, S., ... & Grimshaw, J. M. (2016). Practice feedback interventions: 15 suggestions for optimizing effectiveness. *Annals of Internal Medicine, 164*(6), 435-441.
- Brown, B., Gude, W. T., Blakeman, T., van der Veer, S. N., Ivers, N., Francis, J. J., ... & Daker-White, G. (2019). Clinical Performance Feedback Intervention Theory (CP-FIT): a new theory for designing, implementing, and evaluating feedback in health care based on a systematic review and meta-synthesis of qualitative research. *Implementation Science, 14*(1), 1-25.
- Chen, G., & Mathieu, J. E. (2008). Goal orientation dispositions and performance trajectories: The roles of supplementary and complementary situational inducements. *Organizational behavior and human decision processes, 106*(1), 21-38.
- Crown, D. F., & Rosse, J. G. (1995). Yours, mine, and ours: Facilitating group productivity through the integration of individual and group goals. *Organizational behavior and human decision processes, 64*(2), 138-150.
- DeShon, R. P., Kozlowski, S. W., Schmidt, A. M., Milner, K. R., & Wiechmann, D. (2004). A multiple-goal, multilevel model of feedback effects on the regulation of individual and team performance. *Journal of applied psychology, 89*(6), 1035.
- Hysong, S. J. (2009). Meta-analysis: audit & feedback features impact effectiveness on care quality. *Medical care, 47*(3), 356.
- Hysong, S. J., Best, R. G., & Pugh, J. A. (2006). Audit and feedback and clinical practice guideline adherence: making feedback actionable. *Implementation Science, 1*(1), 9.

# References, cont.

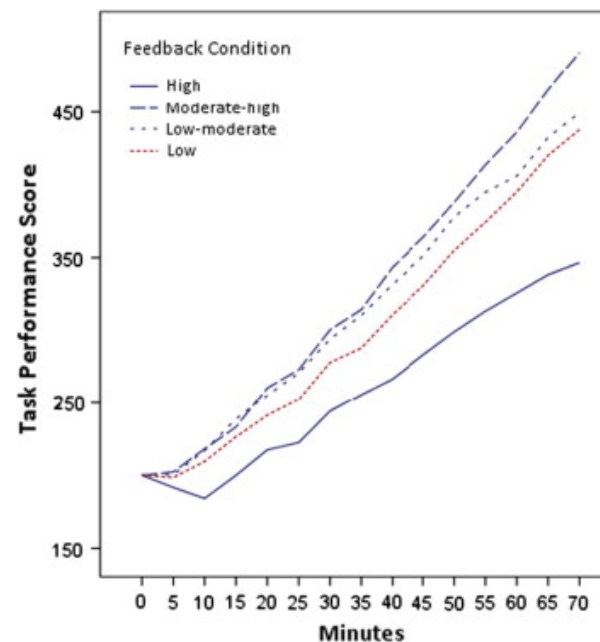
- Hysong, S. J., Kell, H. J., Petersen, L. A., Campbell, B. A., & Trautner, B. W. (2016). Theory-based and evidence-based design of audit and feedback programmes: examples from two clinical intervention studies. *BMJ Qual Saf*, bmjqs-2015.
- Hysong, S. J., Knox, M. K., & Haidet, P. (2014). Examining clinical performance feedback in patient-aligned care teams. *Journal of general internal medicine*, 29(2), 667-674.
- Hysong, S.J., Amspoker, A.B., Hughes, A.M., Lester, H.F., Svojse, E.K. Khan, K., Mehta, P., and Petersen, L.A. (2021) Improving team coordination in primary-care settings via multifaceted team-based feedback: a non-randomized controlled trial study. *BJGP Open*.
- Kluger, A. N., & DeNisi, A. (1996). The effects of feedback interventions on performance: A historical review, a meta-analysis, and a preliminary feedback intervention theory. *Psychological Bulletin*, 119(2), 254.
- Lam, C. F., DeRue, D. S., Karam, E. P., & Hollenbeck, J. R. (2011). The impact of feedback frequency on learning and task performance: Challenging the “more is better” assumption. *Organizational Behavior and Human Decision Processes*, 116(2), 217-228.
- Locke, E. A., & Latham, G. P. (2002). Building a practically useful theory of goal setting and task motivation: A 35-year odyssey. *American Psychologist*, 57(9), 705.
- Lurie, N. H., & Swaminathan, J. M. (2009). Is timely information always better? The effect of feedback frequency on decision making. *Organizational Behavior and Human Decision Processes*, 108(2), 315-329.
- Mitchell, T. R., & Silver, W. S. (1990). Individual and group goals when workers are interdependent: Effects on task strategies and performance. *Journal of Applied Psychology*, 75(2), 185.
- Payne, V. L., & Hysong, S. J. (2016). Model depicting aspects of audit and feedback that impact physicians’ acceptance of clinical performance feedback. *BMC health services research*, 16(1), 260.
- Rosen, C. C., Levy, P. E., & Hall, R. J. (2006). Placing perceptions of politics in the context of the feedback environment, employee attitudes, and job performance. *Journal of Applied Psychology*, 91(1), 211.
- Sheldon, O. J., Dunning, D., & Ames, D. R. (2014). Emotionally unskilled, unaware, and uninterested in learning more: Reactions to feedback about deficits in emotional intelligence. *Journal of Applied Psychology*, 99(1), 125.
- Walton, J., & Gilbert, S. B. (2022). Evaluating the effect of displaying team vs. individual metrics on team performance. *International Journal of Human-Computer Studies*, 160, 102759.

# Feedback Frequency

Feedback frequency and performance curvilinearly related



Mediating effect of task effort on the curvilinear relationship between feedback frequency and task performance



Relationship between task performance and feedback frequency over time.

Source: [Lam et al. 2011](#)

**Table 1** Factors predicted to impact feedback effectiveness by Feedback Intervention Theory and by Cochrane systematic review

Feedback characteristic	Brief definition	Impact on performance predicted by FIT	Meta-analytic findings from Kluger and DeNisi <sup>11</sup>	Meta-analytic findings from Hysong, <sup>16</sup> (healthcare specific)	Meta-analytic findings from Ivers et al <sup>2</sup> Cochrane review (healthcare specific)
Feedback characteristics—content					
Sign of feedback intervention (FI)	Whether feedback (FB) was positive or negative	FIT has no specific prediction	No significant relation (n.s.)	Not explicitly tested	Not explicitly tested
Correct–incorrect	Whether the task was done correctly or incorrectly		n.s.	Not explicitly tested	
Correct solution*	Information about how to do the task correctly	+	+	+	
Velocity†	Change from previous time period	+	+	+	
Attainment level	Number of things produced	–	n.s.	Insufficient variance to test	
Normative information	Direct comparison with others	–	n.s.	Mixed findings	
Norms	Information about the performance of others	–	n.s.	Insufficient studies to test	
Discouraging FI	FB containing a destructive message or cues that discouraged the recipient	–	–	Insufficient studies to test	
Praise	FB containing cues that praised the recipient	–	–	Insufficient studies to test	
Feedback characteristics—format					
Verbal FI	FB (FB) delivered verbally	–	–	–	Small +
Written FI†	FB delivered in writing	+	n.s.	+	+
Both verbal and written	FB delivered both verbally and in writing	Not explicitly addressed	Not explicitly tested	Insufficient studies to test	Large +
Graphical FI†	FB delivered in a graphical format	+	n.s.	–	Not explicitly tested
Computer FI†	FB delivered by computer	+	+	Insufficient studies to test	
Public FI	FB delivered in a public setting	–	n.s.	Mixed findings	
Group FI*	FB referring to group performance	+	n.s.	+	
Individual FI	FB referring to individual performance	Assumed in the theory	Not explicitly tested	+	
Group + individual FI	FB referring to both individual and group performance	Not explicitly addressed	Not explicitly tested	+	
Situational and other variables					
FI frequency	How often FB is delivered	FIT has no specific prediction	–	+	Curvilinear relationship
Goal setting	Whether FB included difficult specific goals, moderate or 'do your best' goals or no goals	+	+	Insufficient studies to test	cf. 'explicit, measurable target and action plan'

Continued

**Table 1** Continued

Feedback characteristic	Brief definition	Impact on performance predicted by FIT	Meta-analytic findings from Kluger and DeNisi <sup>11</sup>	Meta-analytic findings from Hysong, <sup>16</sup> (healthcare specific)	Meta-analytic findings from Ivers <i>et al</i> <sup>2</sup> Cochrane review (healthcare specific)
Explicit, measurable target AND action plan	FB included both an explicit target value and specific action steps for improvement	Could be interpreted as variants of goal setting	Not explicitly tested	Not explicitly tested	+
Feedback source	Who delivered the FB	Not explicitly addressed	Not explicitly tested	Not explicitly tested	Supervisor or colleague better than professional standards review
Direction of behaviour change required to improve	Whether the recipient must increase or decrease current behaviour	Not explicitly addressed	Not explicitly tested	Not explicitly tested	Effect size for decrease in behaviour larger than for increase in behaviour
Task characteristics					
Task novelty	Subjective familiarity with the task	–	n.s.	Task characteristics were outside the scope of the Hysong <sup>15</sup> meta-analysis, and thus not tested	Task characteristics were outside the scope of the Ivers 2012 systematic review, and thus not tested
Task complexity	Number of actions and dependencies among actions needed for successful task performance	–	–		
Time constraint	Whether a time constraint existed on performance	–	n.s.		
Time duration	How long it takes to do the task once	–	n.s.		
Creativity	Degree to which successful performance requires creativity	–	n.s.		
Quantity–quality	Whether the measure of performance reflected quality or quantity	FIT has no specific predictions for these task characteristics, as they do not provide adequate information about the amount of cognitive resources required	n.s.		
Ratings vs objective performance	Whether performance was measured subjectively or objectively		n.s.		
Transfer measure	Where the effect of FI on one task was measured on another task		n.s.		
Latency measure	Whether or not the performance reflects latency or speed		n.s.		
Task type					
▶ Physical task	▶ Physical action		–		
▶ Reaction time	▶ Fast reaction time		n.s.		
▶ Memory task	▶ Heavy memory load		+		
▶ Knowledge task	▶ Specialised knowledge		n.s.		
▶ Following rules	▶ Strict adherence to following rules (eg, following a recipe)		–		
▶ Vigilance task	▶ Monitoring/vigilance		n.s.		
Baseline compliance	Performer's level of compliance with desired practice		Not explicitly tested	Not explicitly tested	–

\*Feedback characteristics predicted by FIT to shift attention to task details and activate task-learning processes, thereby improving feedback effectiveness.

†Feedback characteristics predicted by FIT to maintain attention on task motivation processes, thereby improving feedback effectiveness.