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A Continuing Education Seminar for Health Professionals

MICHELE KARNES, THERESA VALLONE, JANICE TONA, TARA MOONEY, AND ALYSSA MCGEE

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A Continuing Education Seminar for Health Professionals

Michele Karnes, D'Youville College, USA
Theresa Vallone, D'Youville College, USA
Janice Tona, State University of New York at Buffalo, USA
Tara Mooney, New York City Department of Education, USA
Alyssa McGee, Parker Jewish Institute Nursing Home, USA

*Abstract**: Introduction:** This mixed qualitative and quantitative study measured immediate recall and long-term retention of knowledge about Pediatric Acute-Onset Neuropsychiatric Syndrome (PANS) and use of information in practice by health and education professionals. **Methods:** As per standard continuing education (CE) procedures, participants completed a pre-test (T1; n = 120), an identical immediate post-test (T2; n = 120), and an identical three-week on-line follow-up test (T3; n = 37). Paired samples t-test for T1 to T2 scores and repeated measures ANOVA for T1 to T2 to T3 scores were used for analysis with significance set at .05. For qualitative analysis, the most/least beneficial aspects of the seminar were coded for themes, as were comments regarding application of information to practice. **Results**: Increase in knowledge from T1 to T2 was statistically significant ($p < 0.001$) as was T1 to T3 ($p < 0.001$), though significant decline from T2 to T3 ($p < 0.001$) was seen. Qualitative themes revealed that participants found information about strategies in working with children with PANS to be most beneficial and found detailed information about immunology to be least beneficial. On follow-up, participants reported they shared information with colleagues and used information when evaluating children. **Conclusion:** The CE seminar was effective in improving professionals' immediate awareness and knowledge of PANS. Significant retention occurred after three weeks, but this was significantly lower than immediate post-seminar recall.*

Keywords: Health Curriculum, Professional Education

Introduction

New practice-related information, often gleaned from research, is difficult for health and education professionals to access, thereby limiting translation into practice. Delay in the use of important information is known as the research to practice gap (Haynes and Haines 1998). In 2007, the Institute of Medicine called for identification of effective strategies for reducing the gap between new discoveries and practice (Marinopoulos et al. 2007).

Practitioners have increasingly sought ways to improve practice and to access important new information, including attending continuing education (CE) events. As a result, over the past decade professional CE mandates have increased (Institute of Medicine 2011). Although standards for CE providers typically require assessment of learning, many post-event assessments are limited to satisfaction surveys, which do not measure immediate recall or long-term knowledge retention (Marinopoulos et al. 2007). Studies have brought into question retention of knowledge beyond initial learning in continuing education, and reviews of continuing medical education indicate that immediate post-test learning scores do not necessarily indicate retention (Ceravo and Gaines 2014; Forsetlund et al. 2009; Sarayi et al. 2015). The best practice for measurement of learning should include a pre-test, post-test, and follow-up assessment to determine immediate increase in knowledge and retention of knowledge over time (Moore, Green, and Gallis 2009), yet this is often not utilized after CE events (Institute of Medicine 2011).

This study investigated learning from pre-test (T1) to immediate post-test (T2) to three-week follow-up (T3) in three CE seminars on Pediatric Acute-Onset Neuropsychiatric Syndrome

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(PANS), which were designed for health and education professionals. All three seminars covered the same content, but delivery was slightly different as feedback from each seminar was used to improve the next seminar using an action-research design.

Background

Children with PANS, a recently-identified disorder, have dramatic decreases in all aspects of daily functioning at home and school, which are thought to be triggered by infectious or environmental agents. Symptoms include obsessive-compulsive thoughts and behaviors, attention problems, tics, urinary frequency, sensory processing problems, decreased handwriting and fine motor skills, and math deterioration (Tona, Bhattacharjya, and Calaprice 2017; Swedo, Leckman, and Rose 2013). These children often require school accommodations, special education, school nurse plans, occupational therapy, psychological services, social work, and other related services. However, health care and education professionals are generally unaware of the etiology, prognosis, and strategies for management, resulting in many difficulties in the school setting. Educating practitioners and teachers could help reduce these challenges. A CE seminar that could be repeated at several sites, systematically evaluated, and modified using action research could provide the basis for large-scale education.

The purpose of this study was to evaluate and improve a CE seminar by assessing participants' immediate increase in knowledge, retention of knowledge over time, perceived strengths and weaknesses of the seminar, and application of knowledge using an action research model.

Research Questions

Three questions were addressed in this study:

1. Was there a significant difference in test scores from (a) T1 to T2, (b) T1 to T3, and/or (c) T2 to T3 for all three seminars combined?
2. At T2, what aspects of each seminar were identified as strengths (most beneficial) and as needing improvement (least beneficial)?
3. At T3, how had participants applied the information and what further seminar changes would they recommend?

Methods

Study Design

A repeated-measures, mixed-methods design was used to determine change in knowledge and retention of information following a CE seminar presented to three groups of health and education professionals. Using action research, systematic changes were made in the CE seminar over time. Action research is a dynamic process used for the purpose of improving practice in the future. It involves: 1) identification of the problem area 2) collection and organization of data 3) interpretation of data 4) action based on data and 5) reflection (Ferrance 2000). Action researchers engage in progressive problem solving by gathering and analyzing learning outcome data, reflecting on results, and modifying the learning event (Riel 2010).

Each participant was assigned an identification number and asked to complete the test three times: immediately before (T1), immediately after (T2), and 3-weeks after the seminar (T3). Open-ended questions at T2 queried most and least beneficial aspects of the presentation for use in the action-research process of modifying the seminar. Similarly open-ended questions at T3 queried participants about application of information 3-weeks following the seminar.

Selection and Description of Sample Data

Following approval from the D'Youville College Institutional Review Board, de-identified data collected as part of standard CE procedures were analyzed for this study. Data included scores at T1, T2, and T3 for all three seminars along with answers to open-ended questions at T2 and T3. Learners who requested CE units were required to complete T2 and demonstrate competency at 80 percent; all other test submissions were optional. Data were excluded if learners did not complete both T1 and T2.

As shown in Table 1, for seminar I, sixty-seven learners were in attendance, with fifty-four completing both T1 and T2, and nineteen completing T3. For seminar II, fifty-seven learners were in attendance, with thirty-eight completing both T1 and T2, and twelve completing T3. For seminar III, thirty-six learners were in attendance, with twenty-eight learners completing T1 and T2, and six completing T3. Therefore, of the 160 learners who attended the seminars, de-identified data from 120 participants comprised the T1 to T2 set, while de-identified data from thirty-seven participants comprised the T1 to T2 to T3 data set.

Seminar I participants were primarily rehabilitation professionals, with occupational therapy (OT) practitioners representing 66.7 percent of the sample. Seminar II participants were also primarily rehabilitation professionals (39.5% OT, 18.4% physical therapists, and 10.5% speech therapists) and seminar II also had the largest representation of school nurses (28.9%). Seminar III drew the largest percentage of teachers (25%) and psychologists (35.7%) (Table 1).

Measures

Using a 2013 PANS survey of health professionals, for which construct validity had previously been established, the presenter developed a test for the seminars, which was reviewed by three OTs familiar with PANS for face validity. This 42-item objective test required participants to identify symptoms of the disorder, common exacerbation triggers, and medical, therapeutic, and classroom interventions for exacerbations, and was used at T1, T2, and T3. A paper version was utilized for T1 and T2, while T3 was administered online. Open-ended questions at T2 ascertained most and least beneficial aspects of the seminar, and at T3 determined use of information and recommended changes.

Procedure/Protocol

As part of the standard education procedures of the CE provider, all learners were asked to complete and submit a ten-minute pre-test just before the presentation (T1) and an identical post-test immediately following the presentation (T2). Learners who wished to participate in the 3-week follow-up provided their email addresses and received an invitation to complete T3. All seminars were presented to health and education professionals, with seminar I also open to the public. Upon completion of seminar I, the CE provider and presenter reviewed participants' T1 and T2 scores and comments to complete the following action-research steps: (1) identification of problem areas, (2) collection and organization of data, and (3) interpretation of data (Ferrance 2000).

To strengthen the presentation, the presenter made several changes, including content modification and slide sequence, in preparation for seminar II following action-research step 4) action based on data (Ferrance 2000). Similarly, feedback from seminar II was reviewed and analyzed and changes were made in preparation for seminar III, including increasing the duration of the seminar from 3 to 4 hours.

Analysis

Research question one was statistically analyzed using SPSS version 21.0. An ANOVA was first conducted to determine if T1 scores differed among the three seminars, then if T2 scores differed among the three seminars, and finally to determine if T3 scores differed among the three seminars. If no significant differences existed among the three seminars, data from the combined group would be used for analysis.

To answer research question 1(a), a paired samples t-test was conducted comparing T1 to T2 for all participants (n = 120). To answer research 1(b) and 1(c), a repeated-measures ANOVA was conducted on data from participants who completed T3 (n = 37). The significance level of primary analyses was set at .05.

Research question two was analyzed qualitatively by two OT graduate student researchers. All responses from each item (most beneficial and least beneficial) were coded into themes. After initial coding, the researchers collaborated to establish the finalized themes presented in each item. Data for research question three (use of information at T3 and suggestions for changes) were coded into themes by the presenter, reviewed by two other researchers and consensus was reached.

Results

Preliminary Analysis

As noted in Table 2, the mean score for T1 was 25.44 for seminar I, 24.74 for seminar II, and 24.75 for seminar III, and the ANOVA revealed no significant differences in T1 scores among the three seminars ($F = .25$; $p = .78$). For T2, the mean score was 39.81 for seminar I, 39.87 for seminar II, and 38.54 for seminar III, and the ANOVA revealed no significant differences for T3 among the three seminars ($F = 2.74$; $p = .07$). Finally, for T3, the mean score was 29.95 for seminar I, 31.50 for seminar II, and 31.33 for seminar III, and the ANOVA revealed no significant differences for T3 among the three seminars ($F = .60$; $p = .56$). Therefore, scores from the 3 seminars were combined for further data analysis.

Pretest to Post Test Outcomes

As shown in Table 3, the T1 mean score for the total group of 120 participants was 60 percent correct, and the T2 mean score for these participants was 94 percent correct. A paired samples t-test revealed this improvement of 34 percentage points from T1 to T2 was statistically significant ($t = -27.83$; $df = 119$; $p < 0.001$), indicating that the seminar was successful in increasing knowledge about PANS.

Retention at Follow-up

Scores for T3 participants (n = 37) were used to measure retention of information. The mean scores for this group at T1 were 62.4 percent correct, at T2 were 95.3 percent correct, and at T3 were 73.0 percent correct. A repeated-measures ANOVA revealed a significant difference among the three groups ($F = 192.03$; $df = 35$; $p < 0.001$). Contrasts were run, which revealed a significant increase in scores from T1 to T3 ($p < 0.001$) as well as a significant decline in scores from T2 to T3 ($p < 0.001$) (Table 3).

Qualitative Data

The T2 and T3 comments from each of the three seminars were reviewed, coded and categorized into themes (Tables 4, 5, and 6). Overall, participants at all three seminars identified exposure to

the topic, symptoms, and intervention ideas as most beneficial. Participants also appreciated the resources that were provided for ongoing information, which included several websites on the topic along with a reference list. Participants in seminar II and III also valued seminar structure. At T3, participants appreciated the general information and had shared the information with colleagues and families. While few had identified a child with PANS, the information helped some to improve their observational skills and to rule out PANS in some cases. In one case, a family was contacted and immediately sought out a specialist.

The vast majority of comments for least beneficial were generated in seminar I, with twenty "least beneficial" comments, but only one comment from seminar II, and ten comments from seminar III. In all three seminars, participants found detailed information about immunology to be least beneficial to learning. Participants also wanted even more practical strategies for working with children with PANS. Participants indicated concern about pacing and felt rushed at some parts of seminar I (a 3-hour seminar), and were concerned about not having enough breaks during seminar III (a 4-hour seminar). At T3, participants generally did not have suggestions for seminar changes though three participants in seminar III suggested focusing more on application and techniques for managing children with PANS.

Discussion

This study demonstrates the effectiveness of a CE seminar on short-term knowledge and long-term retention of information that was novel to the majority of participants. Short-term knowledge increased significantly from a mean of under 60 percent (T1) to over 95 percent (T2) just after the presentation ended, indicating an understanding of the new information. However, three-week retention (T3) was significantly lower than T2 with 73 percent of the information retained. While this is a statistically significant improvement over T1, the loss of knowledge from T2 to T3 is concerning and calls into question the efficacy of one-time measures of knowledge immediately after a seminar.

Action research proved to be beneficial in seminar refinement. The number of "least beneficial" comments dropped from twenty comments in seminar I to only one comment in seminar II, indicating a vast improvement in the structure of the seminar. Additionally, no participants commented on the structure of the seminar as being "most beneficial" for seminar I, but six commented on this for seminar II and four for seminar III, indicating that the changes moved the structure of the seminar from a limitation to a strength. Unfortunately, the number of "least beneficial comments" increased from seminar II (1 comment) to seminar III (10 comments) reflecting a desire for more application to practice including behavior modification. This was most likely because seminar III was presented to a specific school district, and included more psychologists and fewer rehabilitation therapists than seminar I and II. This speaks to the importance of understanding one's audience when developing and modifying seminars.

Continuing medical education literature indicates long-term retention is greater when learning is active, rather than purely didactic (Ceravo and Gaines 2014; Forsetlund et al. 2009; Sarayi et al. 2015). In this study, the continuing education was delivered as a didactic seminar. Inclusion of active learning such as small group problem solving may have resulted in greater long-term retention of knowledge.

Educational and cognitive psychology literature frequently cites the need for distributed practice of information to maximize long-term retention. Studies have shown that a distributive practice of short but frequent periods of learning has the same immediate outcome as one longer session, but long-term retention is much higher for individuals who utilize distributed practice. The inter-study time between practice sessions could be up to several weeks or one month and still produce a benefit in long-term retention (Pashler et al. 2007). In this study, seminar information was new to most participants and very few actually worked with a child with PANS within the 3-weeks from seminar to follow-up. Some learners from seminar III requested an

online forum for those working with children with PANS. Learners were seeking support and classroom management strategies to accommodate a specific child with PANS. However, their idea for online follow-up may be beneficial for long-term retention of information as well. In light of this request, CE providers may consider other models of educating professionals that add distributed practice to traditional CE seminars, such as online forums, websites, and electronic newsletters. CE providers could also consider granting additional CEUs for completion of supplemental learning activities.

Limitations of Study

There are two main limitations: only a small portion of learners (n = 37) completed T3 and the three-week time frame for T3 may have been too short to allow respondents to utilize information in practice.

Conclusion

The study illustrates the value of using an action research model for CE and the effectiveness of a seminar about children with PANS on short term learning and longer-term retention on three repeated occasions. While participants from varied professions demonstrated significant improvement in knowledge of a novel topic immediately after the seminar, and retained some information, a significant decrease in knowledge at three-week follow-up is concerning. The decline in knowledge retention points to the need for more active learning opportunities during initial learning and resources that allow distributed learning for optimal retention. Efforts should be made among educators to assist learners to revisit and apply new learning to promote long-term retention of information.

Implications

Several lessons for practice can be drawn from this study. First, introducing new clinical evidence-based information, even in short increments, can improve both short and long-term knowledge. Second, long-term retention of information cannot be assumed based on immediate post-test results after a seminar. Third, participants' desire for continued contact with information supports development of new models for professional continuing education that promote application to practice. Finally, an action research model can successfully improve quality of continuing education including knowledge retention and learner satisfaction.

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APPENDIX

Table 1

Demographic Background Information for Pre-test (T1) / Post-test (T2; N=120) and Follow-up (T3; N=37)

Background	***Seminar I***		***Seminar II***		***Seminar III***	
	Pre-test (T1) & Post-test (T2) n (%)	3-week follow up (T3) n (%)	Pre-test (T1) & Post-test (T2) n (%)	3-week follow up (T3) n (%)	Pre-test (T1) & Post-test (T2) n (%)	3-week follow up (T3) n (%)
OT/OTA	36 (66.7)	14 (1.7)	15 (39.5)	5 (41.7)	4 (14.3)	1 (16.7)
PT/PTA	9 (16.7)	3	7 (18.4)	3 (25.0)	0 (0)	0
SLP	1 (1.9)	0 (0%)	4 (10.5)	3 (25.0)	1 (3.6)	1 (16.7)
Nurse	0 (0)	0 (0%)	11 (28.9)	1 (8.3)	1 (3.6)	0
Teacher	0 (0)	0 (0%)	0 (0)	0 (0%)	7 (25)	1 (16.7)
Psych	1 (1.9)	0 (0%)	0 (0)	0 (0%)	10 (35.7)	2 (33.3)
Family	4 (7.4)	0 (0%)	0 (0)	0 (0%)	0 (0)	0
Other	3 (5.6)	2	1 (2.6)	0 (0%)	5 (17.9	1 (16.7)
Total	54 (100)	19 (100)	38 (100)	12 (100)	28 (100)	6 (100)

Table 2

Analysis of Variance of Differences in Mean Test Scores among Seminars

	Seminar	***n***	***Mean***	***F***	***Sig.***
T1	I	54	25.44	.24	.783
	II	38	24.74		
	II	28	24.75		
	Total	120	25.06		
T2	I	54	39.81	1.74	.069
	II	38	39.87		
	III	28	38.54		
	Total	120	39.53		
T3	I	19	29.95	.599	.555
	II	12	31.50		
	III	6	31.33		
	Total	37	30.68		

Table 3

Comparisons of Pre-test (T1), Post-Test (T2) and Follow-up (T3) Scores

Immediate Recall: T1 to T2 Paired Samples Statistics							
	Mean Score (% correct)	N	Standard Deviation	Std. Error Mean	t	df	Sig.
T1	25.06 (60%)	120	5.427	.495	-27.83	119	.000[a]
T2	39.53 (94%)	120	2.615	.239			
Retention at Follow Up: T1, T2, and T3 Repeated Measures ANOVA							
	Mean	N	Standard Deviation	Std. Error Mean	F	df	Sig.
T1	26.24	37	4.81	.50	190.028	2	.000 [a]
T2	40.03	37	1.96	.24			
T3	30.68	37	4.12	.24			
T1 to T3 and T2 to T3 of Within-Subjects Contrasts							
Phase		N	Type III Sum of Squares	Mean Square	F	df	Sig.
T1 vs. T3		37	726.919	726.919	20.269	1	.000 [a]
T2 vs. T3		37	3235.568	3235.568	172.709		.000 [a]

[a] Statistically significant

Table 4

Most Beneficial Aspects of Seminars as Identified Immediately after Seminar (T2)

Theme	Number of comments Seminar I	II	III	Examples of Comments in this Category (Seminar #)
Exposure to the topic	12	18	5	It was very interesting to learn about PANS. I was not familiar with this disorder at all It was all beneficial, learned a lot about it, never even knew, this may change a lot of diagnoses. All of it – I had no prior knowledge
Resources on PANS/ PANDAS	10	11	7	Great websites and resources Videos following lecture reinforces information. I liked the handout it was full of information and suggestions for different symptoms of PANS/PANDAS
Information on background and symptoms	13	3	8	It was beneficial to learn about how this diagnosis presents itself and mirrors many other dx General identification of /definition of PANS. The medical background was good. This goes right along with what's happening in the classroom
Intervention during exacerbation	22	5	10	Strategies ideas to use with children during exacerbation Excellent examples for OT mods/Rx. Very informative and thought provoking. The suggestions about what to do in schools during exacerbation and following
Overall Presentation and Organization of PowerPoint	0	6	4	Excellent. Very knowledgeable and explained the information in a very understandable terms. Easy to listen to and broke up the session very well. Organization of materials and obvious care and concern of presenter

Table 5

Least Beneficial Aspects as Identified Immediately after Seminar (T2)

Theme	Number of comments Seminar I	II	III	Examples of Comments in this Category (Seminar #)
Prioritizing information to meet audience needs	19	1	7	I. Not enough time spent on treatment strategies and behavior modifications II. Too many symptoms III. Not enough time spent on treatment strategies and behavior modifications
Timing / pacing– not enough time	1	0	0	I. Felt a little rushed at the end
Timing / Pacing – too much time	0	0	3	III. Too long / needed more breaks

Table 6

Themes and Comments from Follow-up Survey (T3)

Theme	Number of comments			Examples of Comments in this Category (Seminar #)
	Seminar			
	I	II	III	
Have you used the information and how?				
Increased knowledge/ observation	3	2	0	Taking a closer look at kids who present with a decline or change in abilities I have been more aware of the things to watch for and know it is a team approach to treatment plans when dealing with any set of symptoms.
Shared information with another professional or family	3	11	1	I work with behavioral health adolescents and have shared information with colleagues regarding onset and treatment Contacted parent of mentioned child. They already have correct doctor! Yes- During review of student's file in multi-disciplinary team. Unusual symptoms, however- was able to eliminate PANS as a cause.
Plan to use the info but have not yet	2	0	0	Although I have not used this information, I plan on it being very helpful in the future.
Are there any changes you would suggest to be made to the seminar on PANS to improve the learning experience?				
No changes suggested	9	6	0	I would not make any changes. The seminar was very informative, relevant to my current, and well organized. None that I can suggest. It was an excellent presentation, very informative and well organized.
More application to the classroom/ more techniques	0	0	3	(III) I enjoyed the practical application section on dealing with different symptoms in the classroom near the end of the seminar. I would have liked to spend more time during that section of the material. I feel it applies to many children who present with some of the symptoms (i.e. anxiety) and could be applied over many children on my caseload.

ABOUT THE AUTHORS

Dr. Michele Karnes: Clinical Associate Professor, School of Health Professions, D'Youville College, Buffalo, New York, USA

Dr. Theresa Vallone: Associate Professor, Chairperson and Program Director Occupational Therapy, School of Health Professions, D'Youville College, Buffalo, New York, USA

Dr. Janice Tona: Clinical Assistant Professor, Occupational Therapy Program Director, Department of Rehabilitation Science, State University of New York at Buffalo, Buffalo, New York, USA

Tara Mooney: Occupational Therapist, New York City Department of Education, New York, New York, USA

Alyssa McGee: Occupational Therapist, Parker Jewish Institute Nursing Home, New Hyde Park, New York, USA

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