

# Successful treatment of pill-swallowing difficulties with head posture practice

Bonnie J Kaplan PhD<sup>1,2</sup>, Roberta A Steiger MD<sup>1</sup>, Jamie Pope MSc<sup>3</sup>, Ashley Marsh BA<sup>3</sup>, Maegan Sharp BA<sup>3</sup>, Susan G Crawford MSc<sup>2</sup>

BJ Kaplan, RA Steiger, J Pope, A Marsh, M Sharp, SG Crawford. Successful treatment of pill-swallowing difficulties with head posture practice. *Paediatr Child Health* 2010;15(5):e1-e5.

**BACKGROUND:** Clinics often encounter neurologically intact patients who are unable to swallow pills. All of the interventions published previously have used traditional behavioural techniques, which are time consuming and often not helpful.

**OBJECTIVE:** To determine whether children who had never been able to swallow a whole pill could become successful as a result of an intervention based on head posture.

**METHOD:** A novel intervention was developed based on published research showing that changing head position alters swallowing dynamics. The method was developed in two studies of 240 adults and children, pilot tested in a study of 108 university students with very mild pill-swallowing discomfort, and then evaluated in a study of 41 children who had never successfully swallowed a pill in spite of much instruction and coaxing. Children were recruited from a tertiary paediatric hospital: 34 were clinic patients, four were their siblings or friends, and three were children of hospital staff. The primary intervention involved teaching five head positions (centre, up, down, left and right) followed by a two-week period of daily practice.

**RESULTS:** Eight children (all clinic referrals) withdrew without practicing: four were too ill to practice (primarily due to sedation or nausea) and four simply refused to do the homework practice. All 33 of the children who were able and willing to practice daily were successful.

**CONCLUSION:** Practice with head posture variations was successful in treating pill-swallowing difficulties in all 33 children who practiced for 14 days. A training video can be viewed at [www.ucalgary.ca/research4kids/pillswallowing](http://www.ucalgary.ca/research4kids/pillswallowing).

**Key Words:** *Dysphagia; Pill swallowing; Swallowing disorders*

All clinicians encounter neurologically intact patients who report being unable to swallow pills (see addendum); however, valid prevalence data are lacking. Liquid and chewable medications are generally more costly and less available, and the dosages may be less accurate. Patients with this problem may become noncompliant and receive less-than-optimal treatment, indicating the need to find improved interventions to maximize health.

## Le traitement des troubles de déglutition de comprimés par des exercices de posture de la tête

**HISTORIQUE :** Les cliniques voient souvent des patients sans problèmes neurologiques qui sont incapables d'avaler des comprimés. Toutes les interventions publiées jusqu'à présent font appel à des techniques comportementales classiques, fastidieuses et souvent inutiles.

**OBJECTIF :** Déterminer si des enfants qui n'ont jamais réussi à avaler un comprimé complet y parviendront après une intervention fondée sur la posture de la tête.

**MÉTHODOLOGIE :** Des chercheurs ont mis au point une intervention novatrice fondée sur des recherches publiées démontrant que la modification de la position de la tête change la dynamique de la déglutition. Ils ont élaboré leur méthode dans le cadre de deux études auprès de 240 adultes et enfants, l'ont mise à l'essai auprès de 108 étudiants universitaires qui ressentaient un très léger malaise à avaler des comprimés, puis l'ont évaluée au cours d'une étude auprès de 41 enfants qui n'avaient jamais réussi à avaler un comprimé malgré de nombreuses directives et mesures pour les amadouer. Les enfants ont été recrutés dans un hôpital pédiatrique de soins tertiaires : 34 étaient des patients des cliniques, quatre étaient leurs frères, leurs sœurs ou des amis et trois étaient des enfants du personnel hospitalier. L'intervention primaire consistait à enseigner cinq positions de la tête (centrée, vers le haut, vers le bas, vers la gauche et vers la droite) suivie d'une période de deux semaines d'exercices quotidiens.

**RÉSULTATS :** Huit enfants (tous aiguillés des cliniques) ont abandonné sans avoir fait les exercices : quatre étaient trop malades pour s'exercer (surtout en raison de la sédation ou des nausées) et quatre ont simplement refusé d'effectuer les exercices à domicile. Les 33 enfants capables de s'exercer tous les jours et disposés à le faire ont obtenu les résultats souhaités.

**CONCLUSION :** Des exercices de variation de la posture de la tête ont permis de traiter les troubles de déglutition de comprimés chez les 33 enfants qui s'y sont exercés pendant 14 jours. Il est possible de visionner une vidéo de formation, en anglais, à l'adresse [www.ucalgary.ca/research4kids/pillswallowing](http://www.ucalgary.ca/research4kids/pillswallowing).

## Neurophysiology of swallowing

Swallowing is a complex sensorimotor event involving sequential excitation and inhibition at different levels of the central nervous system (1). The process is generally characterized as having three phases (oral, pharyngeal and esophageal) – all requiring coordination of the mouth, tongue, larynx, pharynx and esophagus (1). Fluoroscopic studies have shown that patients experience esophageal

<sup>1</sup>Faculty of Medicine, University of Calgary; <sup>2</sup>Behavioural Research Unit, Alberta Children's Hospital; <sup>3</sup>Department of Psychology, University of Calgary, Calgary, Alberta

Correspondence: Dr Bonnie J Kaplan, Behavioural Research Unit, Department of Paediatrics, University of Calgary, 2888 Shaganappi Trail

Northwest, Calgary, Alberta T3B 6A8. Telephone 403-955-7363, fax 403-955-2772, e-mail [bonnie.kaplan@albertahealthservices.ca](mailto:bonnie.kaplan@albertahealthservices.ca)

Accepted for publication October 5, 2009

**TABLE 1**  
**Final preferred head position**

	Study 1 (n=106), %	Study 2 (n=134), %	Study 3 (n=108), %	Study 4 (n=33), %
Centre	27.4	44.8	33.3	24.2
Up	7.6	9.7	11.1	36.4
Left or right	22.6	30.6	22.2	18.2
Down	19.8	14.2	33.3	3.0
No preference	22.6	0.7	0	18.2

spasm when prompted to recall unpleasant topics (2), illustrating that the potential role of anxiety must be considered, even when anxiety is not the primary presenting problem.

### Previous interventions

Over the past two decades, case reports (3-5) using conventional behavioural methods of modelling, stimulus shaping (gradually increasing the size of the pill or candy to be swallowed), positive reinforcement and sometimes relaxation training have been published. These interventions can be useful for many children, but they are labour intensive, taking up to 57 appointments or 10 h of clinic intervention for a single patient (6). The largest case series (3) published to date used a shorter training time (generally less than 30 min), but succeeded in only 17 of 29 children.

Specialized pill cups that enable the patient to swallow water and pill simultaneously are also helpful in some cases. In one report (7), the pill cup helped nine of 20 children (ie, 45%), but 11 children who tried the method still failed.

### Head position

Research in healthy adults has shown that head position influences swallowing dynamics: lateral rotation significantly increases the cricopharyngeal opening and decreases upper esophageal sphincter (UES) pressure (8,9). Tucking the chin down has been helpful for neck surgical patients and those with cerebral palsy by decreasing aspirations during feeding (10). The strongest clinical evidence appears to be for lateral positions: five patients with brainstem stroke and nine patients with unilateral cranial dysfunction improved their swallowing dynamics (in terms of UES opening diameters, etc) when their heads were turned toward the paretic side (8,11).

In summary, traditional behavioural approaches for the treatment of pill-swallowing difficulty are labour intensive and only partially successful. There is evidence that lateral head rotation results in a small increase in esophageal diameter as well as delayed UES closure (8,9), but this manoeuvre has not been applied systematically to general pill-swallowing difficulty. Described below are four studies approved by the University of Calgary (Calgary, Alberta) Conjoint Health Research Ethics Board; all participants and parents (for minors) signed consent forms.

## METHODS

### Development and pilot testing

The intervention that was ultimately evaluated in a tertiary hospital sample emerged from a program of research

consisting of three studies with community samples: adults and children who had minimal or no difficulty swallowing pills (studies 1, 2 and 3 in Table 1).

In the first study, 106 men and women (53 of each sex) aged eight to 40 years who reported being able to swallow pills easily were asked to swallow gelatin capsules in each of five head positions (centre, chin tilted up, chin tilted down, head rotated left and head rotated right) and to report how each position felt. Each off-centre position was a deviation of approximately 45° from centre forward. For each head position, two pills were swallowed in succession, the first serving as practice. The capsules had been used as placebos in other research and contained mainly rice flour. The most salient finding was that only approximately one-quarter of the participants found the 'normal' centre position to be the easiest (Table 1). However, the volunteers were given little opportunity to practice in this first protocol, and they were often startled by the request to swallow in a novel position.

In the second study, 134 adults (67 of each sex) aged 18 to 30 years were recruited at a university. This study differed from the first, in that the protocol consisted of two sessions separated by 14 days of home-based practice, to enable participants to habituate to the various positions. Initially, the volunteers were taught the five head positions, and then they took home a set of gelatin capsules and practice sheets. Each daily practice session consisted of a single trial in each of the five head positions. Head position order was pre-assigned and randomly assigned, and the counterbalanced order was changed each day. Perceived comfort for each of the positions was recorded on the practice sheets on a scale from 1 (very uncomfortable) to 5 (very comfortable), to encourage introspection. As in the initial session, each at-home trial concluded with self-rating of comfort from 1 to 5 for each position and specifying the position found to be most comfortable. Based on the work of Logemann et al (8), it was expected that lateral rotation would be identified as the preferred position by a substantial portion of the sample. Although lateral rotation was the position most likely to increase in preference over the course of the 14 days ( $z=2.12$ ;  $P<0.05$ ), it was not the most popular choice at the final session. After the practice sessions, 44.8% expressed an overall preference for the centre position, and the lateral head position was favoured by 30.6% (Table 1). Most importantly, daily practice did have an impact, which solidified the importance of this component of the intervention: preferred position after 14 days of practice differed significantly from preferred position in the first session ( $\chi^2[20, n=134]=125.248$ ;  $P<0.001$ ).

The average adult swallows approximately 600 times in a 24 h period (12), so it was believed that 14 swallows in each position might not be sufficient to overcome the influence of a lifetime of predominantly swallowing in a centred position, especially in volunteers with little motivation to change because they had no difficulty to begin with. Consequently, the third study was a pilot study of 108 university students (50 men, 58 women) aged 18 to 30 years who reported that although they could swallow pills, it was

always a challenge. Only one-third reported that they had ever chosen not to take a pill because of swallowing difficulty, indicating the mildness of their problem. The gelatin capsules and the design remained the same: an introductory session, followed by 14 days of home practice, and then a final session.

As shown in the second study, practice did affect preferred position: 75.0% said that their new preferred position was easier. Two positions (centre and down) were endorsed as the favourites, each by one-third of the participants (Table 1). Unlike the sample in the second study, chin down and centre were the only positions to increase in popularity following home practice. Clearly, this sample was more highly motivated than those without even mild difficulties, because the majority found a new preferred position and 73.1% said that they would change the way they swallow pills in the future.

### Clinical evaluation

The development research and pilot studies showed the following: practice is essential for habituation to the initially odd sensation of swallowing with one's head in new positions; there was no single position that became a consistent favourite among the 348 participants; and even people with very mild difficulties were usually able to find a position that they preferred more than the traditional centre position. The question addressed in the clinical evaluation was whether this intervention would be beneficial in helping children take their prescribed medications.

**Participants:** Forty-one children (24 girls and 17 boys, aged two to 17 years) were referred as a result of advertisements distributed throughout a tertiary care paediatric hospital in a large urban setting. Although the intention was to evaluate the intervention in children with chronic or life-threatening diseases, some families requested that siblings or friends be permitted to participate as well, and two paediatricians asked for help with their own children. The expansion of the sample was permitted, because the additional children also had histories of never being able to swallow a pill despite many attempts. Of the 41 children, four were siblings or friends of the clinic patients, and three were the children of hospital staff. The remaining 34 children were referred from clinics such as developmental paediatrics/mental health (n=11), oncology (n=7), rheumatology (n=5), gastroenterology (n=4), cystic fibrosis (n=2), endocrine (n=2), infectious disease (n=1), nephrology (n=1) and neurology (n=1).

**Intervention:** The first session typically lasted 45 min, of which more than one-third of the time involved explaining the research program and signing consent forms. A brief history of the child's experience with pill swallowing was then obtained: most families had coped in the usual ways, by crushing tablets, mixing the contents with apple sauce or other foods, and finding liquid formulations when possible.

Some of the children were anxious about swallowing pills – an emotion that was likely amplified by the family's worries about the child's illness. Consequently, although the primary intervention was teaching and practicing the

five head positions, a few traditional psychological principles were used to engage the children: reassurance and education, and use of candies. No matter what the problem is, children often need to be reassured that other children experience it too. Children were then shown a diagram of the size of the esophagus (1.5 cm to 2 cm diameter, larger than any medication), and they were educated about the flexibility of soft tissue. Finally, they were taught the funny 'ngunk' noise their throat makes when they swallow water with their heads turned off centre. (Whether that noise, which amuses younger children, is truly the sound of increased cricopharyngeal opening and/or decreasing UES pressure (8,9) remains to be determined by future research, but it is a sound that many of our participants had reported and related to.)

Only candy was used throughout the intervention. The candies varied in size from very small cake decorations and miniature Nerds (Nestlé, USA) up to Tic Tacs (Ferrero, USA), as well as a pharmaceutically prepared placebo consisting of 100 mg lactose, scored in the centre to resemble a medication.

After the consent forms were signed and the child had been taught about esophageal flexibility, the five head positions were introduced using just sips of water. Posture was corrected as needed, and then the child was encouraged to try the positions using a small candy.

It should be emphasized that traditional behavioural techniques of stimulus shaping, positive reinforcement and relaxation training were not used. The brief 2 min reassurance and explanation of the size of the esophagus would not meet the most basic standards of a behavioural intervention. With respect to shaping, children were permitted to select whatever candy they wanted to use for their practice each night. One child did choose to progress fairly systematically from smaller to larger candies, but the others used just a couple sizes, and immediately jumped to the largest when they found a comfortable position and succeeded. In other words, the only 'active' component of this intervention was head posture training and practice.

Follow-up phone calls after 30 days confirmed that the children had successfully transferred their skill to prescribed medications.

### RESULTS

Eight children did not practice, and withdrew from the study. Four of the eight children – all from the oncology clinic – were too ill (due to sedation or nausea). The other four children simply refused to cooperate: one each from the rheumatology and nephrology clinics (both of whom were reported by clinic staff to be oppositional), and two mental health referrals with formal diagnoses of oppositional defiant disorder.

Each child served as his or her own control, in the sense that none had succeeded in swallowing a pill before the intervention. Outcome was measured in terms of success after 14 days of practice. All 33 children who carried out the practice sessions were successful; 29 succeeded in all

five positions, and the other four could swallow in at least a few of the positions.

Although the majority found a head position that they preferred over the usual centre-forward position (Table 1), there was no consistency in the final preferences. It is difficult to explain why so many children (24.2%) ended up preferring the centre position – the one position they had tried for many years (typically) and which had not worked for them. The chin down position was clearly unpopular, and many children liked the up and lateral positions. As with the previous three studies, home practice was essential. In fact, most of the children had minimal success in any position when first introduced to the methods at the initial session.

### Examples of the experiences of study participants

In two children, 14 days was not sufficient practice. One nine-year-old boy with leukemia, who was especially anxious about choking but was very motivated to succeed, insisted on practicing with each size of candy for a couple weeks before he was willing to move to a larger one. A 17-year-old girl initially had difficulty because she tended to trap the candy against the roof of her mouth, swallowing the water alone. She took an extra week to work on her tongue placement.

There were some situations in which long-term compliance was compromised by behavioural and emotional problems. One very hostile 13-year-old boy attended the first session against his will and initially sat with his back turned, refusing to listen. After a few jokes and the introduction of the candy, he began to show interest. To the surprise of the experimenters, when he returned after 14 days of practice, he was successful in all head positions. However, a follow-up phone call revealed that even though he was now capable of swallowing his medications, 50% of the time he refused to do so. Another behavioural issue arose in an 11-year-old boy with fairly extreme texture and taste sensitivities who did not like the taste of the mints or the roughness of the lactose pills. However, he was successful swallowing smooth miniature M&M's (Mars Inc, USA).

Noncompliance was expressed in a reverse manner by an 11-year-old girl with juvenile arthritis. All of the participants were urged to practice only with candy for the first 14 days; it was believed that premature introduction of medication could result in failures, and reinforcement of a child's negative attitude. This particular girl was extremely negative when she arrived for the first session, but she became very excited when shown the head-turning manoeuvre and quickly began swallowing some candies. She wanted to begin taking her prescribed medications immediately, but the experimenter urged her to practice with candies for at least four days if not the full 14 days. Later, it was learned that on the second day she begged her mother for permission to take her medications, which she proceeded to do successfully. The mother reported that before this intervention program, her daughter was so overwhelmed by pill swallowing that she would often sit and stare at her pill for an entire hour and then vomit.

Sometimes the efficacy of the approach was fairly dramatic. In one case, parents of a child with leukemia reported that for the previous year, they had spent 15 min to 3 h with their five-year-old daughter, three times every day, to achieve medication consumption. After two weeks of practicing the head positions, this child taught her entire kindergarten class to swallow pills. In another case of a 13-year-old girl, the mother (a clinical psychologist) had tried behavioural approaches (shaping, positive reinforcement) for approximately one year before entering the study. After seeing the head positions demonstrated, the child was able to swallow candies in 5 min and medication in a few days. In general, the enthusiasm of many of the children was also noteworthy: when they had mastered this skill, several taught their relatives and friends.

### DISCUSSION

In the history of medicine, there are a few examples of very simple manoeuvres made accessible to the general public that have proven useful for the prevention or treatment of common health problems (eg, the Heimlich manoeuvre). Presented here is support for another simple intervention that has broad implications for the treatment of any health problem involving the consumption of solid doses of medication. Success was achieved in all 33 children who practiced for 14 days. The important components of this intervention can be introduced easily by clinicians or to the public at large.

Although there is extensive research on organic dysphagia associated with stroke and neurological impairments (13), the treatment of pill-swallowing difficulty in the general public has previously consisted mainly of traditional behavioural techniques, which are time consuming and only moderately effective. In contrast, we found that some children were able to swallow candies in a few minutes, and all who were willing and able to practice achieved mastery after 14 days or less. Importantly, the skill transferred to medications. The investment of staff time was generally approximately 45 min per patient for the initial interview, but most of that time was for reviewing the research consent forms, which would not be needed in other settings.

Although not essential components of this intervention, good clinical skills are, of course, important for engaging a child's interest: relevant examples are joking about assigning the best homework ever (eating candy every night for two weeks), and illustrating the flexibility of soft tissue to emphasize that the esophagus is expandable (having the kids poke their tongues into their cheeks). In addition, we asked the children to listen for the 'ngunk' noise their throat would sometimes make when they swallowed with their heads turned off centre.

Because our interest was only clinical, no videofluoroscopic data were collected, but some interesting questions may warrant future study. For instance, some of the children immediately identified a preferred position and never deviated from it. Others seemed to enjoy showing their mastery by swallowing their medications in a different position

every day. Videofluoroscopy may reveal differences in the swallowing process of these individuals.

Research is now being carried out with seniors to determine whether this approach will be beneficial for them. A training video is available at [www.ucalgary.ca/research4kids/pillswallowing](http://www.ucalgary.ca/research4kids/pillswallowing).

---

**ADDENDUM:** The term functional dysphagia has been used to describe this difficulty when it affects all types of swallowing; pill refusal has also been used, but the term implies that the child's attitude is negative. For the present paper, we use the descriptive term 'pill swallowing difficulty'.

---

**ACKNOWLEDGEMENT:** The authors thank the Alberta Children's Hospital Foundation for its ongoing support.

---

## REFERENCES

1. Ertekin C, Aydogdu I. Neurophysiology of swallowing. *Clin Neurophysiol* 2003;114:2226-44.
  2. Faulkner W, Rudenbaugh F, O'Neill J. Influence of the emotions on esophageal function: Comparison of esophagoscopy and roentgenologic findings. *Radiology* 1942;37:443-7.
  3. Czyzewski DI, Runyan RD, Lopez MA, Calles NR. Teaching and maintaining pill-swallowing in HIV-infected children. *AIDS Read* 2000;10:88-94.
  4. Beck MH, Cataldo M, Slifer KJ, Pulbrook V, Guhman JK. Teaching children with attention deficit hyperactivity disorder (ADHD) and autistic disorder (AD) how to swallow pills. *Clin Pediatr (Phila)* 2005;44:515-26.
  5. Garvie PA, Lensing S, Rai SN. Efficacy of a pill-swallowing training intervention to improve antiretroviral medication adherence in pediatric patients with HIV/AIDS. *Pediatrics* 2007;119:e893-9.
  6. Babbitt R, Parrish J, Brierley P, Kohr M. Teaching developmentally disabled children with chronic illness to swallow prescribed capsules. *J Dev Behav Pediatr* 1991;12:229-35.
  7. Meltzer E, Welch M, Ostrom N. Pill swallowing ability and training in children 6 to 11 years of age. *Clin Pediatr* 2006;45:725-33.
  8. Logemann J, Kahrilas P, Kobara M, Vakil N. The benefit of head rotation on pharyngoesophageal dysphagia. *Arch Phys Med Rehabil* 1989;70:767-71.
  9. Ohmae Y, Ogura M, Kitahara S, Karaho T, Inouye T. Effects of head rotation on pharyngeal function during normal swallow. *Ann Otol Rhinol Laryngol* 1998;107:344-8.
  10. Logemann J, Rademaker A, Pauloski B, Kahrilas P. Effects of postural change on aspiration in head and neck surgical patients. *Otolaryngol Head Neck Surg* 1994;110:222-7.
  11. Ertekin C, Keskin A, Kiylioglu N, et al. The effect of head and neck positions on oropharyngeal swallowing: A clinical and electrophysiologic study. *Arch Phys Med Rehabil* 2001;82:1255-60.
  12. Pedersen A, Bardow A, Jensen S, Nauntofte B. Saliva and gastrointestinal functions of taste, mastication, swallowing and digestion. *Oral Dis* 2002;8:117-29.
  13. Logemann J. Update on clinical trials in dysphagia. *Dysphagia* 2006;21:116-20.
-