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Thought Disorder in Preschool Children with Attention Deficit/Hyperactivity Disorder (ADHD)

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Abstract

Preschool identification of and intervention for psychiatric symptoms has the potential for lifelong benefits. However, preschool identification of thought disorder, a symptom associated with long term risk for social and cognitive dysfunction, has received little attention with previous work limited to examining preschoolers with severe emotional and behavioral dysregulation. Using story-stem methodology, 12 children with ADHD and 12 children without ADHD, ages 4.0–6.0 years were evaluated for thought disorder. Thought disorder was reliably assessed (Cronbach's alpha = .958). Children with ADHD were significantly more likely than children without ADHD to exhibit thought disorder (75% vs 25%; Fischer's Exact Test = .0391). Thought disorder can be reliably assessed in preschool children and is present in preschool children with psychiatric illness including preschool children with ADHD. Thought disorder may be identifiable in preschool years across a broad range of psychiatric illnesses and thus may be an appropriate target of intervention.

Keywords

preschool; thought disorder; ADHD; story completion

Background

The mental health field has demonstrated an increasing interest in indicated prevention; specifically the idea that early detection and treatment of symptoms not only improves acute function but prevents or limits the longer-term adverse impacts of chronic symptom expression. However, for this approach to be tested and, when appropriate, utilized, early detection of symptoms is critical. There are ongoing efforts to characterize preschool presentation of a variety of symptoms including attentional dysfunction, mood instability, and anxiety (1–10). However, preschool presentation of thought disorder, a symptom with high impairment potential, has received little attention.

Thought disorder is defined as “unusual or dysfunctional ways of thinking,” and can consist of a variety of symptoms including loose associations and bizarre or illogical thinking (11,

12). Thought disorder is an important symptom because it can cause dysfunction in several aspects of functioning (13). Thought disorder is correlated with poor executive functioning (14) and trouble with theory of mind which helps in social functioning especially with perspective taking (15).

Thought disorder is often present in psychotic disorders but can also be present in other disorders such as autism, epilepsy, schizotypal personality disorder, ADHD and in maltreated children (16–25). Methodology to assess thought disorder is available as young as 7 years of age; however, thought disorder has received little attention in preschool populations.

Recently, we have developed a process for identifying thought disorder in preschool children which involves the use of story stems (26). In preschoolers, thought disorder can manifest as bizarreness or violence outside of the initial content of a story stem or having props in a story come to life and act on their own accord. Story Stem paradigms can elicit violent themes in preschoolers with a history of violence or violence exposure; however, that violence tends to be expressed within the context of the story-line; the expression of violent themes unrelated to the story are thought to be more reflective of thought disorder. Similarly, while the purpose of Story Stem paradigms including props is for children to use (“play”) with the props, the embodiment of the prop with an independent identity whose actions are only tangentially or even unrelated to the initial story theme is unusual in other populations and felt to be evidence of thought disorder (26). Preschool children exhibiting symptoms of severe mood and behavioral dysregulation, which may now fall under the Diagnostic and Statistical Manuals, Fifth Edition (DSM 5)(27) category of Disruptive Mood Dysregulation Disorder (DMDD) commonly exhibit thought disorder, with 80% being identified as having thought disorder as compared to 9% of healthy comparison children (26). In children ages 7 and older, thought disorder is present not only in children with severe psychiatric illnesses, but also is present in a broader range of psychopathology including ADHD (28). This study seeks to determine if the same is true in preschool children: Is thought disorder associated with preschool ADHD?

Methods

Participants

This study recruited twelve children (9 female), ages 4.0–6.0 years old, with attention deficit/hyperactivity disorder, as confirmed via a structured diagnostic evaluation by an experienced clinician (as discussed below). Participants were recruited by a mental health consult service imbedded in a primary care pediatrics clinic at the Children’s Hospital Colorado. Exclusion criteria for a projected IQ < 70 (as discussed below) or parent reported major medical/neurological disorder, severe language disorder, and a history of physical or sexual abuse. A group of 12 (8 female) typically-developing children ages 4.0–6.0 were recruited from the same clinic using advertisements. Exclusion criteria for the typically developing group included the same criteria as the attention disorders group plus any DSM IV TR Axis I diagnosis as assessed using a structured instrument and family history of major psychiatric disorder including schizophrenia, bipolar disorder, schizoaffective disorder, major depressive disorder, generalized anxiety disorder, and obsessive compulsive disorder

in a first or second degree relative as determined by parent report. One child was excluded from the typically developing group due to diagnosis of anxiety. Four additional children were excluded (2 with ADHD and 2 from the comparison group) because either they did not complete the required parent and child visits (n=2) or, during participation, the thought disorder assessment was incorrectly administered (n=2).

All participants were accompanied to the visit by a parent. Parents provided consent for their child, as monitored by a local Institutional Review Board. Parents were offered an honorarium for their participation. Table 1 contains demographic information for the study sample.

Diagnostic Measures

Cognitive Assessment—The vocabulary and block design sections of the Wechsler Preschool and Primary Scale of Intelligence (WPPSI-III or IV(29, 30)), completed by trained research assistants blind to group membership, served as a proxy for IQ to screen out intellectual disability or severe language disorder. The vocabulary and block design subtests are used as a proxy for full-scale IQ as they correlate at 0.84 and 0.85, respectively, with full-scale IQ (31). Results are summarized in Table 1.

Psychiatric Assessment—Using the Preschool Age Psychiatric Assessment (PAPA) (1), participants were evaluated by a trained clinician through parent reported symptoms. Each symptom was given a score of 0 meaning not present, 2 or 3 meaning present and to indicate severity. The reliability of the PAPA has been previously assessed in children down to age 2 years with test-retest correlations from 0.56–0.89 for the DSM-IV syndrome scale scores (32). A section was added to the PAPA administration designed to assess for symptoms of DMDD (Appendix 1). Diagnostic categories can be found in Table 1.

Thought Disorder Assessment—Children participated in story completion of four stories, three that are adapted from the MacArthur Story Stem Battery (33) and one story from the Family Story Task (FAST) (34). In each story, the child is provided with characters and small props related to the story, such as a cooking pot and tiny, non-sharp pretend knife, or small non-sharp saw or hypodermic needle made with stickers and a paperclip. The child is given the beginning of the story and asked what happens next. After a practice story, with guidance from the examiner to elaborate using narration and motions of the props, no prompts are given after the story stem unless the main problem is not addressed by the participant. Story Scripts for the birthday party story and “Spilled juice” story can be found in (35). The Band-Aid Story can be found in (34). Please see Appendices 2 and 3 for the “Saw” and “Vaccination” stories, as these were unique stories created for this study based on guidelines from (35). The childrens’ responses to the story stems stories were videorecorded for later scoring by a blinded coder.

The scoring method used to rate thought disorder was developed to address prevalent themes in stories found in prior work (26). These themes included bizarreness or violence outside of the original story stem and props coming to life and acting on their own accord. Recordings were blind coded by a trained rater (AH), blind to subject group membership. 50% of

videorecordings were re-rated by another trained blind coder (KK), also blind to subject group membership.

Results

Thought disorder was frequently present in preschool children. Examples are presented in Table 2. Each subject was assessed in four stories; each story was scored for presence/absence of bizarreness/violence outside the context of the story and props coming to life (8 possible data points per child). Thought disorder was identified in at least one child for each of the four stories utilized (Table 3). Reliability was high across all data points (Cronbach's $\alpha = .984$) and when determining whether each child had evidence of thought disorder in at least one story stem (Cronbach's $\alpha = .958$). One point on one story differed between the two coders. With the one disagreement the primary rater scoring was used.

Seventy-five percent ($n=9$) of preschoolers with signs of attention disorders versus 25% of typically developing preschoolers demonstrated bizarreness or violence outside of the original story stem in at least one story (Fisher's exact test = .0391).

Discussion

Thought disorder is present in some preschool aged-children and is reliably detectible. This is consistent with the previous reports (26), providing additional support to the hypothesis that thought disorder can be reliably detected in preschool children using story stems.

The proposed criteria for classifying a story stem response as thought disorder is that the response includes either violence outside of the initial content of a story stem **or** having props in a story come to life and act on their own accord. The inclusion of an either-or criterion was based on previous work with a group of severely psychiatrically ill preschoolers where some children demonstrated one or the other type of response, but not both. In this study, having responses include having props in a story come to life and act on their own accord was uncommon and did not occur in the absence of violence outside the initial content of a story stem. Given the small sample sizes in both this and previous work, it is unclear whether a true difference in frequency of having props come to life is present; however, this should be investigated as a potential marker of either diagnostic specificity or illness severity.

The primary goal was to assess whether, in preschoolers, thought disorder is associated with ADHD. Thought disorder was three times more likely in children with ADHD than in a typically developing comparison group, suggesting that, as is true in older children, thought disorder extends to a broader range of preschooler psychopathology including ADHD.

ADHD rarely presents in isolation and 50% of the children in this study with ADHD also presented with comorbidity. This high rate of comorbidity is consistent with studies of older children with ADHD and thought disorder, which had rates of comorbidity as high as 95% (28). In this study, particularly in the context of the small sample size, we cannot rule out that thought disorder may be related to the other psychiatric comorbidities. However, in the ADHD group, the likelihood of thought disorder was similar for preschoolers with (five of

six) and without (four of six) psychiatric comorbidity, suggesting an association with ADHD.

Both the clinically referred and typically developing sample was largely female which, particularly when combined with the small sample size, prevented examination of gender as a contributing factor. However, previous studies have been weighted toward male samples (65%) (26), suggesting thought disorder presents in both genders.

Meeting criteria for any DSM-IV Axis 1 psychiatric disorder was an exclusionary criterion for the typically developing comparison group, yet twenty-five percent 25% of the typically developing group also demonstrated thought disorder. This was unanticipated and higher than previously reported. Additional factors not assessed, such as home environment or violence exposure insufficient to elicit post-traumatic disorder symptoms, may have contributed to thought disorder in control children. However, given the recruitment of ADHD and comparison subjects from the same population, these factors are likely equally distributed across groups and thus do not detract from the identified relationship to an ADHD diagnosis. With the small sample size, it may also represent a random deviation from population based values. It is unclear whether thought disorder in the healthy comparison group is a transient phenomenon of little clinical significance or reflective of subclinical symptoms that may predict increased risk for later illness. Longitudinal work will be necessary to address this issue.

Summary

Thought disorder is a symptom common to several psychiatric diagnoses that can cause dysfunction. This study extends the finding that thought disorder can be reliably identified in preschool children and that it is more common in children with ADHD. While thought disorder has been clearly defined in older populations, in preschool children using story-completion themes of violence or bizarreness and props coming to life and acting on their own seems to be reliably detectable across sexes, severe mood and behavioral dysregulation, and also ADHD. At this point thought disorder is demonstrated in some typically developing children but it is unclear if this is a precursor to psychopathology. With the increased interest in recognizing psychiatric illness and its precursors as early as possible, it is important to look at symptoms that are detectable in the preschool years and may be a target for intervention. Thought disorder may be an etiological factor in later development of social and cognitive dysfunction.

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Appendix 1. PAPA adaptation of DMDD criteria

Definitions and questions Codes	Mood Dysregulation Coding Rules
Temper Remember to get examples and behavioral descriptions	
How would you	o = Does not have trouble controlling

describe X's temper? Have you noticed that X has trouble controlling his/her temper?	temper 2 = Has trouble controlling temper	
Has s/he had behavioral outbursts like verbal rages or physical aggression towards others or property?	0 = Absent 2 = Present, with verbal temper outbursts in reaction to common situations, but without physical aggression 3 = Present, temper outbursts in reaction to common situations, with physical aggression (i.e., hitting, biting, kicking, head banging)	intensity ☐
What did s/he do?		
How long did it last? Was this out of proportion in intensity or duration to situation or provocation?	0 = not out of proportion in intensity or duration to situation or provocation 2 = Out of proportion in intensity or duration to situation or provocation Hours:minutes	intensity ☐ duration ☐
How often do these types of outbursts occur?	0 = never/rarely 1 = 1-2 times per week 2 = 3 times per week 3 = > 3 times per week 4 = more than once per day	frequency ☐
Between these outbursts, is X irritable, angry and/or sad nearly every day?	0 = mood is normal between outbursts 2 = mood is negative between outbursts	☐
Did you or anyone else comment on his/her mood?	0 = negative mood not observed by parent/others 2 = negative mood observable by others	☐
When did you first notice this happening?	0 = < 12 months 2 = ≥ 12 months	onset / /
Has there ever been a break from this pattern for more than 3 months since it	0 = break for > 3 months 2 = no breaks/break < 3 months	☐

started?		
Where do these outbursts and/or negative moods occur?	Home 0 = not present 2 = present 3 = severe	Home freq intensity ☐ ☐
Home, school/daycare, with peers?	Daycare/school 0 = not present 2 = present 3 = severe	Daycare/School freq intensity ☐ ☐
In which setting are the outbursts and/or negative moods the most severe?	Elsewhere 0 = not present 2 = present 3 = severe	Elsewhere freq intensity ☐ ☐

Exclusions for mania
Not better explained by another diagnosis
Not due to drugs of abuse or medical condition

Appendix 2: Saw Story

Story Theme: Sharp Object

Props: wood, saw

Characters: C1, C2, D, M

E: Mom is working in the garden. Robert/Rose and Michael/Michelle are playing in the backyard and watching Dad make them a new play house. They have been so excited about helping Dad build their new house so they can play in it. Dad is using a sharp saw to cut the wood.

D: "Girls/boys, I have to go next talk to mom in the garden, but I'll be right back. Stay off the wood and don't touch the tools while I am gone, okay?"

E: *Show me and tell me what happens next.*

Issue Prompt 1: *What did the kids do while Dad was gone?*

Issue Prompt 2: *Then what did Dad say when he returned?*

Remove: wood, saw, C2

Appendix 3: Vaccination Story

Story Theme: Sharp Object

Props: Table, Needle

Characters: C1, D, M, Nurse

E: *Robert/Rose goes to the doctor's office with his/her mother and father to get a vaccination, the kind of good shot that prevents illness. When Robert/Rose gets to the office, he/she sees the nurse and the hypodermic needle on the table.*

N: *It's time to give the shot.*

E: *Show me and tell me what happens next.*

Right CHILD Left

Camera

Prompt: *What about Robert's/Rose's shot?*

If no clear ending is presented:

Is this a good place to end your story? OR How does the story end?

Remove: Table, needle, nurse

Table 1**Demographic Information**

	Control N=12	ADHD N=12	Statistic^a
Age (years)	4.54 (0.52)	4.99 (0.78)	t(22)=1.66, p=.112
Female Gender	8 (66%)	9 (75%)	p=1.000
Race/Ethnicity			
Caucasian Non-Hispanic	7 (58%)	3 (25%)	p=.213 ^b
Caucasian Hispanic	1 (8%)	2 (16%)	
Other/Mixed	4 (33%)	7 (58%)	
Hollingshead Score			
Mother (n=24)	16.5 (3.7)	12.8 (5.5)	t(22)=1.93, p = .066
Father (n=23)	14.3 (4.5)	12.0 (3.8)	t(21)=1.32, p = .202
Cognitive Assessment			
Block Design ^c	9.8 (2.3)	10.0 (6.5)	t(21)=0.10, p=.921
Vocabulary ^d	10.5 (3.0)	8.2 (4.0)	t(20)=1.54, p=.139
ADHD Subtypes			
Inattentive		2 (16%)	
Hyperactive/impulsive		1 (8%)	
Combined		6 (50%)	
NOS		3 (25%)	
Comorbidities ^e			
Other Disruptive Behavior			
ODD		3 (25%)	
Anxiety disorders			
Obsessive Compulsive		2 (16%)	
Separation Anxiety		2 (16%)	
Specific Phobia		1 (8%)	
Psychotic disorders			
Schizophrenia		1 (8%)	
Delusional Disorder		2 (16%)	
Other			
Pervasive Developmental Disorder		1 (8%)	
Encopresis		1 (8%)	
Pica		1 (8%)	
No Non-ADHD diagnosis	12 (100%) ^f	6 (50%)	

All Values are Mean (SD) or n (%)

^aStatistical assessments utilized students t tests for comparisons of continuous measures and Fishers Exact Test for comparisons of percentages.

^bCaucasian Non-Hispanic vs all other groups

^c23 of 24 children completed block design

^d 22 of 24 children completed vocabulary

^e Numbers add up to more than 12 as psychiatric comorbidity is common

^f Meeting criteria for a psychiatric illness was an exclusionary criteria for the typically developing group

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Table 2

Examples of Thought Disorder in Child Narratives

Spilled Juice Story – Comparison Group Child – Example of bizarreness or violence outside of the original story stem

And then Michael, is this Michael (this is Michael) knocks down the juice (Michael knocks down the juice) because he was **walking on the table** (because he was walking on the table) [knocks dad over] and **he jumped on daddy** (and he jumped on daddy) Hey, what's that about and Michael says he wants to go to the dinosaur museum (oh) but it was nap time (it was nap time). They will sleep all together now (they are going to sleep altogether now) and then when it was time to wake up mommy wakes up first then the daddy and then Michael waked up but Robert (Robert) he was still sleeping (he was still sleeping?) and he started to wake up right now (and then he started to wake up, is that a good place to end your story?)

Spilled Juice Story – ADHD Group Child – Example of bizarreness or violence outside of the original story stem

[Character knocks into table], (What happens next?) then Rose spills the juice all over (Rose spills the juice all over) and she was angry because she wants her party back (she's angry because she wants her party back) [**doll is stomping on cups then kicks mom, then knocks mom on to the floor, knocks all the other characters on the floor**] (Does anything else happen?) **Rose is angry and she throws everybody on the floor** (she's angry and throws everybody on the floor. Does anything else happen?), she wants her party back (she wants her party back. Is that a good place to end the story?) Nods

Saw Story – Comparison Group Child – Example of bizarreness or violence outside of the original story stem and props coming to life and acting on their own accord

And then Michael was trying to walk over it (Michael was trying to walk over the wood) Yes, then Robert is going to be in big trouble, he's going to play with this (ok), tink tink tink, ow! Robert is sorry about that and he **poked Michael with the saw** (he poked Michael with the saw) and then daddy came back and he said what happened to Michael, Robert made a mistake he played with the **saw and cut me** (so Robert made the mistake and played with the saw and cut me) and then daddy was doing it again (and then daddy was cutting the wood again) and then they needed a hammer (a hammer?) ya (we don't have a hammer, gotta pretend) What about an invisible hammer? Boom, boom, boom. (He uses and invisible hammer to what?) to make it fixed (to fix it?) and then the house was all ready (the house was all ready?) and then **watch this boom ow! Ow! Michael is hitting up against the wood and Robert laughed** (Robert laughed) **and that was very funny and they were like ow!**

Saw Story – ADHD Group Child – Example of bizarreness or violence outside of the original story stem

So they start cutting, they start cutting the wood. (they start cutting the wood). Robert does but Michael doesn't (Robert does but Michael doesn't). Michael is a bad kid. (Michael is a bad kid) no not Michael, Robert. (Robert) Does stuff (does stuff) that's not good for him to do (does stuff that's not good for him to do. Does anything else happen?). The dad comes back (the dad comes back ok). What did you do? (what did you do?) you guys are in big trouble Who did it? (You are in big trouble, who did it?) Robert! Sorry dad (Robert says sorry dad. What's happening) **He's hitting his face** (he's hitting his face). Ok x that part out (x that part out, ok). So he carries them in and puts him in the bedroom (he carries him and puts him in his bedroom). Can I use the table for a bed (let's play pretend that he puts him in his bed. Is that a good place to end your story?). No. He starts sawing again (he start sawing again. What else happens). he finally finishes the door (he finally finishes the door) I don't know how to make a play house (you don't know how to make a play house). **Then Robert comes back, by standing on his head** (Robert comes back by standing on his head). He says I'm really sorry (I'm really sorry, is that a good place to end your story?)

Vaccination Story – Comparison Group Child – Example of bizarreness or violence outside of the original story stem

[puts doll on table and give it a shot] (what's happening now?) He's done, (he's done) he got the shot (he got the shot). And the grandma got back (and the grandma got back) at home (at home) I can't see the grandma (we're pretending the grandma is at home. Does anything else happen in this story?). No. **This doctor at an apple and she died** (that doctor ate and apple and she died. Is that a good place to end your story?) Yes

Vaccination Story – ADHD Group Child – Example of bizarreness or violence outside of the original story stem

She here hang on, [messing with prop], now you I got 4 shots last year in my leg (you got 4 shots last year?), then gives Rose shots one, two, three, four, one, two three, four, then she goes to get her a bandaid (she goes to get a bandaid). [nurse flies into air], then give her band aids, one two, three four, one two three four, then nurse says come with me, (how does the story end?) then hold hands (they hold hands) **I guess Rose is kinda high, until they are kinda high and they walk in the air** [Rose and nurse] (and they walk in the air? Is that a good place to end your story?).

Band-Aid Story – Comparison Group Child – Example of bizarreness or violence outside of the original story stem

This guy needs the doctor (this guy needs the doctor) cause he cuts his self (cause he cuts his stuff) cause he cut his hand (cause he cut his hand. Ok what happens then) the doctor gave him medicine and he got better (the doctor gave him something and he got better. What else) can I see the doctor (we're going to pretend the doctor is somewhere else. Does anything else happen in this story?) **The dad jumped on him** (the dad jumped on him) **and on the mom** (and on them mom) cause he's a bad guy (cause he's a bad guy) he's making something (he's making something) **He's making them so they die** (he's making them so that they die. What's happening now?). **He ate them** (he ate them) **and his brain** (and his brain. Does anything else happen in your story) **he cut his head** (he cut his head) **open** (open) now he's got to stay at the doctor all night (he's got to stay at the doctor's all night) **and he died** (and he died) this guy's alive (what does he do?) this guy's alive, (he's alive) he can't cut himself anymore (and he can't cut himself anymore, what's happening now?) **This guys' cutting his head** (this guy's cutting his head) **and now this kid is cutting his dad's head** (this kid is cutting his dad's head) **Now he's grabbing the head** (now he's grabbing him) **and he put it in the toilet** (he put him in the toilet. Does anything else happen in your story?) no (is that a good place to end your story?) ya.

Band-Aid Story – ADHD Group Child – Example of bizarreness or violence outside of the original story stem

I get hurt, the mom and the dad fight (the mom and the dad fight) and touch it like this [wields the dad] **put it on the ground like that** [throws dad on the ground] and [orders examiner] pick it up. (do you want me to get it? Ok, so dad goes on the ground) Yeah. Dad says I'm sorry Mommy (dad says I'm sorry mommy), and the mom gave it to the baby and put it on her, and put it on her, and put it on her, and put it on her, and put it on her finger (so mom gave it to the baby and put it on her finger) **and is it bleeding still?** (I don't know is it?) Ya. (so It's still bleeding?) **her whole face is bleeding** (her whole face is bleeding), **now her can't see** (no she can't see), is it bleeding now? (I don't know, is it bleeding now?) **Ya it's still bleeding** (it still bleeding), now the nurse need to come (now the nurse needs to come), ya, (does anything else happen) **her hair bleeds** (her hair bleeds, anything else, so is that a good place to end your story?), Nope. (nope) get the nurse for check it (so

you want me to get the nurse so she can check it), Yeah (so what happens) get the nurse and check it (ok is that a good place to end the story?)
Yeah. Get the nurse! (get the nurse, the nurse is in here) What's it check, isn't it checking it?

() = examiner speaking, [] = nonverbal action in story portrayal, bold for what was coded as thought disorder

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Table 3

Number of Children (%) with Thought Disorder by group, story and thought disorder theme.

Story and theme	Control (n=12)	ADHD (n=12)	Total (n=24)
Story: Spilled Juice			
Theme: Props to Life	0 (0%)	1 (8%)	1 (4%)
Story: Spilled Juice			
Theme: Bizarreness/violence	3 (25%)	4 (33%)	7 (29%)
Story: Saw			
Theme: Props to life	1 (8%)	1 (8%)	2 (8%)
Story: Saw			
Theme: Bizarreness/violence	3 (25%)	2 (17%)	5 (21%)
Story: Vaccination			
Theme: Props to Life	0 (0%)	1 (8%)	1 (4%)
Story: Vaccination			
Theme: Bizarreness/violence	1 (8%)	6 (50%)	7 (29%)
Story: Band-Aid			
Theme: Props to Life	1 (8%)	2 (17%)	3 (13%)
Story: Band-Aid			
Theme: Bizarreness/violence	1 (8%)	4 (33%)	5 (21%)

Bizarreness/violence = bizarreness or violence outside of the original story stem

Props to Life = props coming to life and acting on their own accord