SIM baby dolls to the rescue? Implications for school nurses using simulator dolls to manage unplanned teen pregnancy.

Abstract

Background: School nurses are key professionals in the promotion of sexual and reproductive health which should include using high fidelity baby simulator dolls.

Aim: To explore teenager's perceptions of their practical parenting skills and their attitudes towards experiential learning from using high fidelity baby simulators.

Methods: Virtual baby simulator dolls were used as part of sex and relationship education with school pupils (aged 15-16 years) to look after over a weekend. Pupils were recruited from a UK Academy and completed a diary of their experiences while parenting, received quantitative feedback simulator reports and completed a post-study evaluation questionnaire.

Findings: Pupils saw the virtual baby project as beneficial and important in schools and perceived an improvement in their understanding of practical parenting skills, sexual health and contraception.

Conclusion: The implications of this paper are towards involving school nurses more actively in sexual health education in schools via the use of high fidelity simulators as creative pedagogy in Personal Sexual Health Education (PSHCE).

Key words: *School nursing, sex education, teenage pregnancy, virtual baby, high fidelity simulators*

<u>**Key points**</u>

- School nurses play an important role in sexual health education in schools and need to work more closely with PSHCE teachers in sexual health education, contraception and unplanned teenage pregnancy lessons.
- The use of virtual baby dolls as a kinesthetic aid to practical parenting enables teenagers to understand the responsibility of being a parent.
- The virtual baby program enables teenagers to experience meta-cognitive growth in practical parenting skills along with better understanding of dealing with babies' needs, coping with stress and time management.
- Teenagers involved in parenting the virtual baby benefit as they learn the importance of contraception, delaying sexual relations and planning for their futures including being more aware of the challenge of parenting.

- There has been limited evaluation of the long term use of virtual baby doll (high fidelity simulators) in PSHCE lessons and limited discussion of their use in educational policy.

Reflective questions

1. Why is the UK teenage pregnancy rate still higher than many European countries in 2019 despite the general decline in teenage pregnancy?
2. Why haven't schools made better use of school nurses as an educational resource for PSHCE sexual health and relationships education?
3. How many school nurses advocate for comprehensive sex education programs that educate teens to protect themselves if they engage in risk behaviours?
4. Why isn't there a standard use of virtual baby simulator dolls in PSHCE sexual health lessons in secondary schools in the UK?

Background

The UK Sexual health landscape

Good sexual health has been an important public health issue for many decades with the issue of teenage pregnancy in the UK still being considered a stigmatising event. Teenage pregnancy has continued to raise social concerns around societies' values being undermined and young people engaging in sex from an early age outside of stable relationships (SmithBattle,2013; Sorhaindo,2017).

In the UK, we have seen a stable decline in teenage conceptions and births (Wellings et al, 2016) but there are significant socio-demographic variances depending upon geographical location. This research was carried out in a Secondary Academy in Wiltshire which as a county has an under 18 conception rate of 14.9 (per 1,000 females aged 15-17 years) compared to Hampshire (14.6) and Dorset (12.8) according to ChiMat needs assessment information (2015). These conception statistics illustrate the fact that teen conception is still a significant factor in the south of England despite the conception rates being lower compared to ex-industrial urban areas in the north of England which typically have worse health outcomes and slower rates of health improvements compared to the affluent south (Olson et al, 2012).

Compared to Western Europe, the UK still has the highest teenage birth rate (Hadley et al, 2016) and babies born to teenage mothers experience 60% higher infant mortality rates, are generally at more risk of poverty (Cook and Cameron 2015), low educational attainment, poor housing and poor health, and have lower rates of economic activity in adult life (Department of Health, 2010). The growing concern apart from teenage pregnancies is the spread of sexually transmitted infections with chlamydia the most common among young people, in the UK (Health Promotion Agency, 2003; Adams et al, 2004).

Teenage Pregnancy Strategies

Over the years, there have been numerous behaviour change interventions to tackle this social phenomenon (Jepson et al, 2010) including the UK Government's teenage pregnancy strategy (Hadley et al, 2016). This aimed to halve the rate of teenage pregnancies in 10 years by improving education, increasing awareness and supporting teenagers with the responsibilities of parenting and completing their education. The Framework for Sexual Health England (2013 pg9) also called for *accurate, high-quality and timely information that helps people to make informed decisions about relationships, sex and sexual health*. It stated the need to invest in preventative interventions that built personal resilience, self-esteem and promoted healthy choices. Linked to this were improvements to the sexual health curriculum taught in UK schools with a sharper emphasis given to the involvement of external agencies like NHS Sexual Health Advisors running drop in sessions in schools and the use of School Nurses SNs (Rose and Freeman, 2017; Moore et al, 2016). Current approaches to teaching sexual health in schools include a multidimensional perspective combined with more behaviour change approaches using health professionals (Whitaker et al, 2016). With the updated PSHCE curricula for primary and secondary schools' curricula (Department for Education, 2018) further emphasis is being placed on how teaching can help support the development of important attributes in pupils that encourage honour, broadmindedness, inner strength and self-belief as well as sexual health and contraception. Primary schools offering SHE emphasise new areas including respect in *relationships, embedding tolerance and raising awareness of discrimination*, while Secondary schools will cover more pressing issues around sexual health and marriage like *online grooming, mental and physical health*. More importantly, school-based sex education which historically was mostly inadequate, too biological and weak now considers wider issues (Eisenberg et al, 2007).

The importance of School Nurses teaching PSHCE

Linked in with this educational update is the need to have health professionals like School Nurses (SNs) working alongside teachers to provide evidence-based information on contraception and health services to empower teenagers on issues of sexual health and teenage pregnancy prevention (Whitaker et al, 2016). According to Public Health England (PHE) Teenage Pregnancy Prevention Framework (TPPF, May 2018) partnership working with a range of health professionals, social care and safeguarding agencies is vital to understand the relevance of healthy relationships and teenage pregnancy as a holistic approach. According to Nursing in Practice (2017) the decline in teen pregnancies in the UK has been related to the key role of SNs acting as sexual health educators running drop in sessions in schools to offer advice, guidance on contraception and sexual health within a confidential arena. By providing appropriate social support for pregnant teens and their significant others (parent, boyfriend) research has found a positive impact in terms of their ability to cope with stress during pregnancy and parenthood (Devereux et al, 2009). Interestingly, for some young women, motherhood is not being perceived as a limitation or

negative experience to completing their education or developing a career. Teenage pregnancy and motherhood is being seen by some young people as a driving force to gain maturity and responsibility for their actions with the hope to return to education, improve their lives and future of their children (Middleton, 2011; O'Brien Cherry, 2015; Anwar and Stanistreet, 2015). Whatever teenager's perceptions of sex and teen parenting, SNs offering comprehensive sexual health education with teachers, can reach populations deemed to be high risk and make an impact to adolescent outcomes before engaging in sexual activity (Guttmacher Institute, 2016).

This can only work when SNs adopt a bi-directional instead of dyadic teaching approach to adolescent pregnancy which effectively brings student voices into the discussion of sexual health and practical parenting within school contexts, endorsing a holistic community care delivery model (Falk-Rafael &Betker, 2012a). Education presented in a reassuring, non-condemnatory environment will promote confidence in discussing issues relating to sexuality. Dickson et al (2018) advocate SNs using a critical caring theory approach to sexual health education with adolescents in schools due to the positive impact for improved meta-cognition around sexual health practices. In this way, the school nurse has an important role in communicating with key stakeholders including adolescents, parents, school managers and curriculum developers using their evidence based experience, trusted credibility and knowledge about sexual health, contraception, unintended and unplanned pregnancy. School teachers can work collaboratively with school nurses in delivering effective sexual health education (e.g. abstinence from and delaying initiation of sexual activity, condom use, contraception use) that can have a significant protective effect on adolescent sexual behaviors that will affect their future and help students understand their sexuality (Stanger-Hall and Hall, 2011; Chin et al, 2012; Lindberg and Maddow-Zimet, 2012; Hadley 2013; Oringanje et al, 2016; Dickson and Lobo, 2018 p.78).

Cotton (2019) found that the format of SNs teaching PSHCE and sexual health in most UK secondary schools was to run whole school PSHE days with different health professionals and agencies. Beneficial, though this is, we feel that this may not be enough education to prevent adolescents from engaging in risky sexual behaviour. Unlike in the USA where school nurses run sexual health drop in clinics in schools (Daley et al, 2018) the role of the school nurse in England is complex with a key role in health education in primary care and a role in advising and supporting schools, rather than directly delivering education (Hoekstra et al, 2016). Interestingly, Martell (2005) found in a school nurse survey that 80% school nurses felt their work was valued by schools; 37% school nurses felt they wanted to spend more time with school pupils discussing sexual health and health promotion and 19% of school nurses surveyed wanted to spend more time in the classroom. This being the case, according to the RCN (2015) using nurses in schools adds to weighed down SN workloads with the service being under-staffed and dwindling. Research has shown that the role of SNs is confusing with a lack of clarification for schools (Whitehead, 2006; Crabtree and Davis, 2009). Despite this, the RSE Hub Schools Health Education Unit (2014) surveys of school pupils from the *'What do you think about Sex Education'* survey found *students much preferred a visiting health*

professional to deliver health-related topics and thought it best if the same teacher/health professional delivered the majority of PSHCE curriculum. Furthermore, *students advocated a range of teaching for delivery and discussions on sexual health education in a non-judgemental manner which also included encouragement that they could be supported to parent well if they became parents.*

This paper argues the need for schools to work more closely with health professionals and school nurses using more engaging forms of sexual health education which open discussion about sex and relationships with students in a confidential forum while running the virtual baby project for students to illustrate the challenges of parenting as a teenager.

The use of the Virtual Baby Project

It is well recognised that the youth of today are au fait with using Interactive Digital Interventions (IDI) for sexual health (ie: web-based interventions, mobile phone apps and social network sites). Such digital tool communication platforms engage youth in sexual health promotion and risk reduction (Guse et al, 2012). Furthermore, digital interventions facilitated by teachers or clinic staff work better as they encourage young people to think about sexual health more deeply and technology-based interventions have been found to increase sexual health awareness about safer sex norms and attitudes (Bailey et al 2015; Widman et al, 2018).

Related to this is the growing use of high-fidelity Infant simulator dolls as an educational practical parenting tool in secondary schools predominantly in high income countries. Virtual babies are life size infants that cry, need feeding, burp, crave parental attention and need nappy changes mimicking a real baby. The computer chip inside the doll then saves and reports data on whether the student provided the necessary attention in an appropriate and timely manner (Borr, 2009). There is strong evidence that the use of these high fidelity infant simulators in secondary schools in the US, Australia, Canada has had a positive effect in creating a more realistic view of parenting with increased desire to not be a parent while a teen, better understanding of the responsibilities involved in infant care, the possible implications of sexual intercourse and acknowledgement that failure to use contraceptives during intercourse significantly increases their personal risk for becoming involved in an unplanned pregnancy (Hillman, 2000; Divine and Cobbs, 2001; Out and Lafreniere, 2001; Borr et al, 2009; Somers, 2014). School pupils who took *Baby Think It Over* home did not fall pregnant on average almost a year longer than the control group.

Virtual baby simulator dolls have been evaluated for a wide range of outcomes from sexual behaviour and contraceptive use to views on practical parenting responsibility (Somers, 2014). Efficacy outcome studies on infant simulator-based programmes found it positively discouraged teenagers from engaging in unprotected sexual activity by creating simulated classroom experiences that emphasize the adverse consequences of such behaviour (Kralewski and Stevens-Simon, 2000). Research has shown that interaction with the virtual baby dolls provides a creative learning environment for pupils when

incorporated into teaching on sexual health as part of creative pedagogy (Gibbons, 2001; Aldrich, 2003; Issenberg et al, 2005) and effectively teaches pupils about the infant-caregiver interaction (Julal, 2018).

However, some of the evidence as to whether health promotion or the VB program education programmes were able to reduce teenage pregnancy rates has been sparse, contradictory and sceptical on the long-term benefits. A recent such evaluation of the Virtual Infant Parenting (VIP) among girls aged 14 years in Australia found no effect on prevention or delay of teenage pregnancy at 20 years of age (Brinkman et al, 2016). Of girls in the intervention group, 17% got pregnant at least once in their teenage years compared with 11% in the control group (who received standard advice). The Brinkman study suggested that the VIP programme doesn't help prevent teen pregnancies, but actually increased the risk in agreement with an earlier review which concluded that there was inconclusive support for the efficacy of infant simulators (Somers et al, 2001). Brinkman et al (2016) also reported no effect for learning using the VIP with control groups of girls from high socioeconomic status.

Despite this negative research, there is a diverse range of education and learning that can be gained from using the VB dolls that is often not reported or evaluated in its role towards health promotion. Some infant simulator programmes have involved videos showing teenagers with babies, others extensive educational components and others only giving out the infant simulator with little information on its use and expected responses. Overall, when infant simulators have incorporated a more realistic challenge factor closely linked to the realities of being a teen mum, infant simulators have shown changes in attitudes toward early pregnancy, improved interest in personal future achievement by participants (Borr, 2009) better self-esteem along with a stronger understanding of practical parenting (Bakermans-Kranenburg et al, 2015). A 2016 Cochrane review of 53 randomised controlled trials (Oringanje et al, 2016) concluded that VB programmes with a combined educational and contraceptive component seem to reduce unintended pregnancy but found inconclusive evidence on measures related to initiation of sexual intercourse, use of birth control, abortion, childbirth, and sexually transmitted disease.

In the UK, there are pockets of local innovation with schools endorsing the VB project but there isn't any coordinated national programme to exploit the potential of IDI for sexual health promotion with taught sexual health education from SNs. The Brinkman et al (2016) paper discouraged many researchers and journal editors from publishing research on the virtual baby simulators as a standalone tool in reducing teenage pregnancy. This is a shame as these dolls are still being endorsed by U.S manufacturers as the best form of practical parenting intervention in schools.

This paper re-addresses the use of the Virtual Baby programme in schools seeing it as a valuable aid in health promotion and teen pregnancy deterrent. Our study attempts to tie in the use of simulator babies as a form of instructional learning to improve meta-cognition and enhance pupil mind set with regards to teenage pregnancy and parenting. Additionally, we strongly advocate the use of health professionals including SNs to work in partnership with PSHCE and Health and Social Care teachers in promoting a practical parenting approach to unplanned unintended pregnancy.

METHOD

Sampling and Recruitment

 The cohort of pupils in the study came from a Secondary Academy in Wiltshire with a high proportion of Pupil Premium pupils. The school lies sixth in the league tables for Wiltshire for all pupils, and in the top quartile of schools nationally in terms of pupils from disadvantaged backgrounds. Their challenges are often compounded with high levels of special educational need and low self-esteem.

Pupils were recruited onto the Mothers Union Virtual Baby (VB) programme with the permission of the Head and Curriculum Team Lead in Health and Social in 2015. When the VB program started Health and Social Care Sixth formers were only allowed but in subsequent years after (2016-17) KS4 Health and Social Care pupils were given the opportunity to take part in the VB program too. As a result, pupils at the school became used to the Mothers Union VB 6 week program and it gained in popularity with all years becoming aware of the teenage pregnancy prevention agenda.

However, the pupils that were recruited for the current evaluation research took part in the VB project in 2017-18 and were mainly Health and Social Care KS4 and KS5 pupils. Altogether 40 pupils took part in the Mothers Union VB program (2017-18) aged between 15 and 17 years. A total of 28 out of 40 pupils agreed to participate in the evaluation study (aged 15-16years) which took place 3 months after the Mothers Union 6 week program which started in mid-October 2017 and was completed by the end November 2017. The 28 Health and Social Care pupils were mostly from KS4 (Year 10 and 11), no Sixth formers were willing to participate in the evaluation research due to mock exam and coursework pressures. The majority of the recruited participants were female (89.3%) with only 3 boys (Table 1). This sample was found to be nearly homogenous as expected for the pupil's ages and gender in terms of baseline characteristics.

Age	Frequency	Percent	Sex	Frequency	Percent
15	17	60.7	Female	25	89.3
16	11	39.3	Male	3	10.7
Total	**28**	**100.0**	**Total**	**28**	**100.0**

Table 1: Age and Gender Demographic of Study Participants

Ethical approval

All procedures were performed in compliance with relevant laws and institutional guidelines. Appropriate ethical and organisational ethics approval was ascertained from the Headmaster, Academy Board of Governors and Mothers Union Board. Furthermore, working in collaboration with Hull University academics, Hull University Research Ethics Committee approval was ascertained prior to the research and

the researchers, maintained confidentiality and anonymity when collating questionnaire data and results analysis. Student names were not required and all questionnaires simply asked for gender, age and year group. All pupil comments used in the results were anonymised and no reference to the name of the school or personal details were required or made.

Virtual Baby Intervention

Virtual baby (VB) simulator dolls are high fidelity dolls produced from RealityWorks, USA that have 15 schedules which have been based on recordings of real babies (aged from 8 days to 8 weeks old) and diaries kept by real parents. The sim baby dolls have been designed in seven ethnic groups and incorporate dolls with different skin tones. Each doll has:

> **A contoured back and weighted body of 7lbs (3kgs) and 21" (52cm) long,**
> **A realistic newborn baby appearance,**
> **Uses a bottle or breastfeeding devise,**
> **A small computer chip inside the baby which is programmed to follow actual schedules of a newborn baby.**

Figure 1: RealityWorks simulator dolls

Research Phases

Phase 1- Mothers Union VB Program Induction to Pupils

Mothers Union were invited along to a Health and Social Care class in KS4 and KS5 in September 2017 to inform pupils about the VB Project and the opportunity to take a baby doll home to parent for the weekend. The Mothers Union representatives explained how the project worked and demonstrated the programmed doll including nappy changing, feeding and rocking. Pupils were given information about the VB project and an informed consent form for guardians to sign. The pupils were asked to consider an appropriate weekend that they could parent the doll (October-November 2017) which would be acceptable to their parents and family. Once pupils had the informed letters signed and had selected the weekend from the 6 week block that had been assigned for each school, then the project began. During

the 6 week VB block pupils were instructed by Mothers Union representatives and school staff to meet in an allocated room every Friday at the end of the school day to collect their programmed VB doll.

Phase 2- Pupils taking VB home over the weekend

Five Pupils every Friday during the 6 week VB block could choose the doll they wanted to take home. This included a choice of gender (Male/Female) and ethnicity (Caucasian/Asian/Black or Japanese dolls). Once students had selected their baby, they filled in a registration form which included their name, school, tutor group, their chosen dolls name and pupils were instructed to write down their tag number from their ID wrist band they were given. The pupils were told to securely attach their ID wristband to their wrist and were instructed to use the ID tag on their baby's stomach, lower back or shoulder as these were the target areas which responded to the ID tag. Every time their baby began to cry they were instructed to use the ID tag within 2 minutes to calm the baby down and signal that their parent was nearby. Pupils were then told that the baby would continue crying until the correct care was given but they only had 2 minutes to give the correct care (nappy change, feed, burp or rock) after using the ID tag, otherwise a neglect status would be recorded on the care report generated at the end of the weekend for each pupil. Pupils were reminded to treat their babies gently and that rough handling including unsupported head, shaken baby and incorrect positioning would result in mishandling status on the care report. Mothers Union representatives explained that the electronics unit in their babies back would register all proper care, missed care and mishandles and that abuse and neglect status from inappropriate care would lead to their babies shutting down. This situation occurred if their baby recorded a neglect status for more than 12 hours or if the baby was abused more than 23 times. Additionally each pupil received an accessories backpack with nappy, baby clothes, blanket and bottle. The pupils were given a diary to keep over the weekend as well as the contact number of one of the Mothers Union representatives. This enabled pupils to have a point of contact to talk to when their baby was not responding to the ID wristband. All the VB dolls were programmed to start at 5pm Friday on the same 'easy' program but the following morning each doll followed a variable program from easy care (minimal crying for short periods) to difficult care (crying for up to 40 minutes). On the Sunday evening at 9pm, all the VB dolls were programmed to close down to enable pupils to sleep and get ready for their school week ahead (see Figure 2).

Figure 2: First Five KS4 pupils to take the VB doll home

Phase 3 Mothers Union VB programme debriefing

At the end of the 6 week Mothers Union VB program at the school, the Curriculum Lead Health and Social Care (CTL HSC) invited Mothers Union back to run a debriefing session (lasting 1 hour) with the pupils that had taken the babies home as part of the VB project. Downloadable information directly from the baby's computer providing quantitative analysis of handling and mishandling care was given to each pupil involved in the VB program. The care reports provided information on all proper care given, any mishandle care including the type (missed nappy, missed feed, poor head support) and the time and date. Each VB simulator feedback report which included an overall percentage score for practical parenting as well as comments about the pupils progress from the Mothers Union representative encouraging the student to take the baby home if the overall percentage was low or congratulating the pupil if percentages were higher than 70%.

Once the reports had been handed out, Mothers Union asked pupils about their diary entry comments. Each diary contained a series of open ended opinion based questions such as '**how I felt about …bringing baby home, when baby cried for the first time, giving baby back after the first weekend'** and questions asking pupils **'what I notice about myself when I am outside home with the baby and how other react when I am out and about with the baby'.** The diaries included an experience recording table with **'day, time, what am I doing, what would I rather be doing, what is baby doing and how do I feel'** sections for pupils to record their experiences with the baby over the weekend. Finally, each diary had a section on what pupils had learned over the weekend including questions like **'what have I learnt about caring for a baby, myself and what advice would I give friends about having a real baby'**. The debrief session allowed pupils to appreciate the challenges of being a teenage parent. At the end of the debrief session, Mothers Union thanked pupils and staff for taking part in the VB programme and the VB programme was complete at the school.

Phase4- Evaluation research recruitment and data collection

Having gained permission from the Head and gaining appropriate ethical approvals, the CTL HSC (who was the lead researcher of the evaluation project affiliated with Bournemouth and Hull University Health, Social Sciences and Midwifery research team) attempted to recruit pupils to the evaluation phase of the VB programme 2-3 months afterwards (Jan-Feb 2018). Pupils were given out another informed consent letter for parents and pupils to sign explaining the VB evaluation research aims, objectives along with the purpose and content of the questionnaire. Further guidance on teenage pregnancy, sexual health and contraception services for pupils and parents concerned about the research, publication or personal implications of the research was provided. Each letter explained how the data from the pupil VB simulator feedback reports would be triangulated with diary entries and comments from the post-VB program questionnaire.

In February 2018, the researcher (CTL HSC) ran an after school session for an hour which asked pupils who had given their consent to take part in the evaluation study to attend. The researcher handed out

the post-VB program questionnaire and pens to pupils and then explained the standardised instructions asking pupils to answer each question independently without conferring with others and asked them to think retrospectively about their practical parenting VB doll experience. The semi-structured questionnaire included Likert type questions designed to elicit pupil perceptions about their experience parenting the virtual baby, their understanding of responsibility and awareness, relationships, knowledge about pregnancy prevention and their perception of the use of the virtual baby simulator as an educational tool. The questions were a mixture of open and closed questions along with Likert Style questions. This measure was developed and validated by Hull Ethics Committee and a pilot test was carried out on two year 12 pupils that had taken the baby home the previous year. They assessed the questionnaire in terms of the wording of the questions and the ease of understanding and answering the Likert style questions. Pupils completed the post-VB program questionnaire within the hour and were then thanked for their participation. The researcher then explained how the data would be anonymised and pupil's diary commentaries along with the VB feedback report would be used to inform the evaluation research.

Data Analysis

The open-ended questionnaire questions were transcribed and subjected to qualitative framework analysis (Ritchie and Spencer, 1993). This means data is sifted, charted and sorted in accordance with key issues and themes using five steps: familiarization; identifying a thematic framework; indexing; charting; and mapping and interpretation (Srivastava and Thomson, 2009). The Likert Style question responses were then tabulated and subjected to descriptive statistics (median and IQR) and Mann-Whitney U tests. For the Likert type questions, the tests performed and statistics presented are median and interquartile range for central tendency and frequencies (proportions) for variation in responses. The Mann Whitney tests were carried out using two grouping variables of sex and age. Results are reported in mean rankings and exact one-tailed test is used at significance level of 95% (p<0.05) because of the small sample size (N=28). The one-tailed significance tests for significant relationships between sex (boys and girls) and age (15yr and 16year) towards both directions of the 5-point Likert scale for all question sets. The findings are presented into themes and interpreted with proportions of responses on the attitudes, feelings and learning 5 point scales. Because of the small numbers, proportions are reported onto a condensed 3 point scale.

RESULTS

Demographics and Gender Differences

The evaluation study involved 28 pupils aged 15-16years, with the majority being female (n=25 89.3%) and only 3 boys (10.7%). Analysis of whether there were gender differences in the Likert questions showed higher Mann Whitney scores on most questions for the boys compared to the girls in the study.

Generally, the boys who took part in the research seemed less motivated and engaged with the project compared to the girls who were very keen to take care of their baby and be the first to name and claim it. The boys that took part were not exceptionally popular with their peers yet could not be classed as introverts (according to their teachers).

However, statistical analysis of the Likert question **'I felt I did not benefit from taking the virtual baby home for the weekend'** revealed a statistically significant gender difference. The boys mean rank for this question was higher than the girls (p=0.03). It is possible that male participants were helped to care for the Virtual Baby while at home and so did not feel like it affected them or benefited them which would need to be explored in light of the other findings. Furthermore, statistical analysis revealed that boys disagreed on **'being good at handling the Virtual Baby'** (U= 9, p=0.02), agreed to **'feeling that they could deal with a baby as a teenager'** (U=12, p=0.03), and believed that **'having a baby while a teenager is good'** (U= 7, p=0.01). However, due to the small sample size of boys involved in the study (n=3) these findings cannot be generalised and needs further research to validate. In addition, there were gender differences on Likert statements asking pupils '**what are the important things you would consider before having a baby'**. The statement that was highest for the boys was **'you no longer live off mum/dad'** (U=37, p=0.96) compared to the girls who thought that the statement **'you have completed your formal education'** (U=88, p=0.77) and the statement **'you have some savings'** (U=88, p=0.78) were more important than other statements before having a baby. Additionally, the boys mean ranks towards agreement for **'when boyfriend/girlfriend asks you for a baby and when your friends are having a baby'** which were also statistically significant (U= 12.5, 12; p= 0.03). Furthermore, when pupils were asked to consider '**how has taking the virtual baby home affected your thoughts'**, boys scored the highest for question 10.3 **'A stable caring relationship is more important before starting a family'** (U=35, p=0.82). In contrast, girls gave the highest scoring to question 10.4 **'I can have a baby on my own'** (U=92.5, p=0.96). Overall, it is very difficult statistically analysing gender differences between the Likert questions but it is clear to see that there some clear differences in perceptions of boys and girls which included '**dealing with a baby as a teenager', being influenced by friends who've had babies and the need to have a job, secure housing and savings to be able to financially support the baby**.

Effect of the Virtual Baby

Pupils revealed learning new skills including how to handle a child, what it could be like to have a child of their own and how hard it was to be a teenage parent. The main themes that were analysed included responsibility, awareness, practical parenting skills, relationships and motivations (Figure 3).

Figure 3: Bar graph illustrating percentage outcomes of the pupil VB evaluation
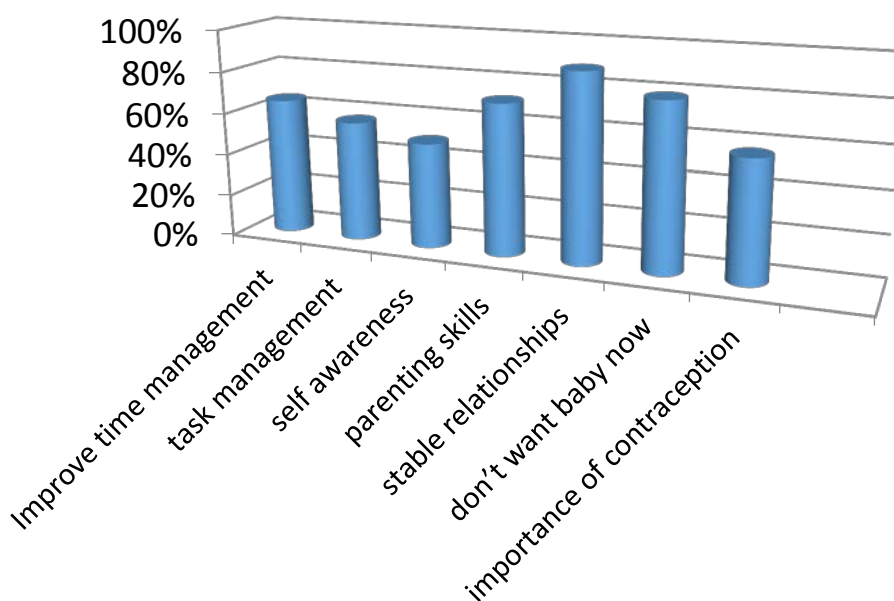
Responsibility and awareness

The experience of the virtual baby contributed to the teenager's sense of responsibility, self-awareness and other personal skills in general. The data showed that pupils learned personal skills of patience, being responsible and concentrating on tasks:

"It opened my eyes on responsibility. Showed me how I would cope as a teen mum. Showed me I didn't want a child now" [Female pupil aged 15 KS4]

"Helped me with time management. Showed me it was hard caring for a baby as a teen. I learnt not to say anything when people looked" [Female pupil aged 16 KS4]

The findings from the Likert items revealed majority of the respondents agreeing to improved parenting skills (72%), time management (65%) and task management (57%), improved self-awareness (50%) and a stronger sense of responsibility and understanding with the importance of contraception (57%). In addition, during the weekend when they had the virtual baby, 75% reported rarely or never feeling inadequate at caring for the baby independently. This reveals that the majority of pupils were mentally prepared for the challenge and when this statistic was compared with debrief and diary comments, many pupils said that they looked forward to parenting their baby and tried hard to understand its demands. Only a few pupils (7%) sad they felt inadequate at looking after the baby on their own and needed the help of friends and family (18%).

Practical parenting skills

The participants recalled that the VB project taught them practical parenting skills as 72% of the participants recalled having a clear understanding of how to look after and handle the baby. The responses from participants strongly agreeing (21%) and agreeing (43%) were:

"It gave me an insight into what it's like to have a child" [Male pupil aged16 KS4]

"Got to experience what it's like to be a mother. I understand parenting is hard. I need more support" [Female pupil aged 15 KS4]

From diary entry commentaries and the debrief session, it was clear that participants who felt they had learned a lot about practical parenting from their experience with the virtual baby, also stated that they had gained an increased understanding of time and task management. This tied in with the questionnaire data on time management with overall agreement (65%) and task management overall agreement (57%). Additionally, participants stated that they had a clearer understanding of how to look after/handle a baby after their experience of practical parenting with the VB doll over the weekend (72%). Pupils highlighted other parenting skills that they learned such as confidence in caring for a VB (79%), increased patience and calmness (78%) and feeling in control most of the time while with the VB (78%). Therefore for the majority of pupils the experience of practical parenting was positive and many expressed the desire to look after the virtual baby again. The majority of the pupils (75%) reported benefiting from taking the VB home for the weekend but a few reported not much benefit. For one such participant, this was because she already had a baby brother and the VB wasn't near enough as hectic as the sibling. Some participants commented that they wanted to learn more about taking care of a baby, and also more guidance from a healthcare professional such as a School Nurse, on preventing teenage pregnancy (14%) along with more information and support from websites that give advice on pregnancy prevention and contraception (36%).

"I think that we should have it [VB doll] for longer, so we get more of an experience and more advice from an actual healthcare professional like a nurse not just teachers at the school"[Female aged 16 KS4]

"Would have been good to have a few lessons practicing how to handle care for the baby….not just a demonstration"[Male aged 16 KS4]

However, giving more support towards making the experience easier for the teenagers would not necessarily prepare them for pregnancy and may not have provided improved simulator percentages for handling and caring for the virtual baby over the weekend. It was evident from such comments that some pupils had not understood the project aims and objectives, only seeing it as a 'computerised doll to look after' instead of as a real baby. In conjunction with this some pupils felt that they did not benefit from taking the virtual baby home over the weekend (15%). The pupils who described not benefiting from the

experience had expectations to be taught how to care for a baby and not the intended experience of the difficulty of teenage motherhood. Some pupils felt that they did not enjoy the experience because they mishandled the baby on more than one occasion (15%) and felt out of control most of the time (11%) because they could not understand baby's needs (7%) causing them to cry a lot (11%) and feel unhappy caring for baby over the weekend (7%).

Relationships

The experience of the VB was supported by family and friends. Participants report being supported and encouraged by family and friends throughout the weekend:

'Mum really helped me with it. Dad and sister didn't really see a difference'. [Female aged 15 KS4]

'My mum loved the virtual baby, she helped me towards the end of the weekend, but I had to stay in a room on my own'.[Female age 16 KS4]

The view of the VB by friends and family was mixed with pupils feeling embarrassed to take it around (25%) which impacted on their experience of being responsible for the baby over the weekend. For example:

"When we went to KFC, the baby started crying and I was really embarrassed because everyone was staring at me". [Female aged 15 KS4]

"My friends were embarrassed but they got used to it" [Male aged 16 KS4]

"Family were eager to see how I cope with a baby. My friends were interested and quite shocked for me to take so much responsibility". [Female aged 16 KS4]

There were big differences in terms of participants' view of relationships, geared towards stable and caring relationships. The 3 point measures of relationships questions show majority agreement about when to have a baby which were: stable relationships (89%) and partner support (79%). 57% reported that they would consider having a baby if their partner asked them for one. In contrast, 79% of participants demonstrated they would not consider having a baby just because their friends were having babies.

Motivations about preventions of teenage pregnancy

Knowledge about pregnancy prevention

There were positive understandings about prevention of teenage pregnancy which was centred on contraception use and abstinence.

"Make sure if you are in a sexual relationship it is safe. Consider contraception; the pill, implant, coil".
[Female aged 16 KS4]

"Use a condom and girls can get implant so you can't get pregnant". [Male aged 16 KS4]

"Don't have sex if you do, use protection". [Female aged 15 KS4]

Over half (57%) of the pupils attributed the VB experience as making them think about the importance of contraception. There was no big difference in need for more information about contraception with over half (58%) disagreeing to needing more guidance about preventing teenage pregnancy. This could possibly be as a result of understanding the difficulties of taking care of a baby from the VB experience which could have put the pupils off in regard to considering early pregnancy. It could also be that these pupils have future long-term plans of starting a family that did not necessitate further guidance.

Experience of VB on teenage pregnancy
The experience of the pupils revealed the majority appreciating how difficult having a baby could be and consequently delaying the age when they have children, when they thought they could manage a baby. Comments included:

"Enjoyable but will wait years before having children" [Female aged 15 KS4]

"It showed me that I am not ready for a baby. I would need a lot of money and it showed me I can't always do what I want to do" [Female aged 16 KS4]

"I now know the highs and lows of having a baby at a young age" [Male aged 16 KS4]

"I realised that I don't want babies any time soon because they cry too loud" [Female aged 15 KS4]

For most pupils, the care and attention required left them exhausted and a realisation that while it was fun, it was not something they wanted any time soon. For example:

"I realised the responsibilities are too much, they cry too much, they are too needy so I realised I don't want one". [Female aged 15 KS4]

"I hated it and to never do it again until I am ready and more mature" [Female aged 16 KS4]

Indeed 78% of the pupils felt that they should wait before having a baby. The diary and debrief commentaries found that the overall experience put these pupils into the 'shoes of teenage mums' and they reported understanding the struggles, the need for support and subsequently declaring they did not want a baby while young.

"I didn't think it was going to be as hard as it was plus the things you have to give up". [Female aged 15 KS4]

It is reassuring that the majority of pupils (75%) revealed not having recently considered having a baby. Accordingly, the pupils had advice for other teenagers thinking about having a baby (68%) and this included what they had experienced looking after the virtual baby over the weekend:

"Don't do it. Live your life to the fullest you can have a baby whenever" [Female aged 15; male aged 16 KS4]

"Think about your future beforehand"[Female aged 16 KS4]

"Make sure they know what to expect. The responsibilities are high- they can't just give up after a week like the virtual baby". [Female aged 15 KS4]

"Think about it carefully because you may lose people because you don't have a lot of time to yourself. It's hard and exhausting make sure your relationship is stable". [Female aged 15; Female aged 16 KS4]

Even pupils who described not learning from the experience had prohibitive advice to teenagers:

"Should wait until you can financially look after the baby and not rely on your parents. Also finding a job when pregnant or with child at a young age will be hard". [Female aged 15; male aged 16 KS4]]

"Don't do it! You're just gonna waste your life away having to look after your baby, and you have no money to care for it!" [Female aged 15 KS4]

"Don't do it, it's harder than it looks. You won't be able to go out partying without worrying about a babysitter etc" [Female aged 15 KS4]

"Should wait until you can financially look after the baby and not rely on your parents. Also finding a job when pregnant or with child at a young age will be hard" [Female aged 16; Male aged 16 KS4]]

From the whole experience of practical parenting and lessons learned of the difficulty in caring for the baby and responding correctly to its needs, many pupils stated that later years were more suitable for having a baby. Over half of the pupils stated that a suitable time to have a baby was at the age of 20, while 22% stated that being over 25 years was better for parenting. The overall median age for having a baby was age 22 years. Many pupils felt the mid to late twenties was the ideal age for parenting and when questioned about older mothers, pupils stated that after the age of forty the mother was too old to be able to bring up the children.

VB experience as an educational tool

Feeling excited but worried about control/taking care of another
The majority of pupils were positive about the prospect of being in charge of a baby and having a new experience. This excitement of taking the baby home (68%) was viewed as giving them control (63%) and a feeling of being grown up and responsible (33%).

"It helped me learn lots of new skills and taught me a lot about having a baby. It is a good educational tool". [Female aged 15 KS4]

Worries were focused on the challenging 'control of a human" which was a stressful prospect and nervous experience for some who did not know what to do. Some debrief and diary comments were around their subjective perceptions of tiredness, fatigue, sleep deprivation, frustration but most pupil commentaries expressed their happiness in being involved in the project and the positivity towards the virtual baby as an educational tool.

"It is hard work, time consuming and exhausting! [Female aged 16 KS4]
"It was a good experience. Interesting, frustrating but good" [Female aged 15 KS4]
"Worst weekend ever, lack of sleep, very tired" [Female aged 15; Male aged 16 KS4]

However, some pupils did not see the benefit of the virtual baby and stated that it should have been more interactive (eg: lips and eyes that move and respond to your voice) as well as the computerised program of feeding, nappy changing, rocking and burping. For example:

"The baby was nothing like a real baby. All they did was cry. They was annoying and embarrassing"[Female aged 15; Male aged 16 KS4]
"Not realistic, no motherly care" [Female aged 16 KS4]

It seems as though the pupil's expectations of the virtual baby program were unrealistic and for the pupils reporting no benefit, it could be that the lack of enjoyment in caring for the baby impacted the perceived benefits of the Virtual baby experience. From these extracts it shows that pupils experienced the difficulties of teenage pregnancy, a changed expectation from fun and cuddly, to exhaustion which put them off having children for another few years. This cannot be said for the male participants. From the diary entries and debrief sessions, two boys said that "they could handle being a father if their girlfriend got pregnant while still at school". The boys involved in the study felt that the virtual baby experience was "odd but necessary" (male 1 aged 16), "embarrassing but a good experience" (male 3, aged 16) and that "they would recommend the project to other boys but would not want to take part again" (male 2, aged 16).

Discussion

The present study aimed to evaluate the acceptability and effectiveness of a virtual baby program among teenagers in one city in the UK. Findings found that 79% pupils did not want a baby while in their teens, 57% understood the importance of contraception and 89% said they would need to be in a stable relationship to look after a baby. Overall, 72% pupils said they had gained an improved understanding of practical parenting and were pleased they had the opportunity to experience the Virtual Baby. The

findings revealed that pupils learned from the experience as a deterrent to teenage and unplanned pregnancy. Even though there was no baseline to compare with, the findings show the attributed effect of the program to teenagers' perceptions and attitudes. Specifically, the perceptions on what it means to have a baby as a teenager were influenced by their experience of caring for the Virtual Baby over a weekend. Contrary to findings where the teenagers did not improve knowledge, this sample of pupils self-reported increased knowledge. This is because unlike in (Kralewski and Stevens-Simon, 2000) where 80% of the sample had previous baby-sitting experience, only 2% in this study had baby siblings or previously baby-sat. This study confirmed previous evidence where girls who had previous babysitting experience did not find the virtual baby useful and hence little or no impact on their learning (Brinkman et al, 2016). What is important to learn from this is that the effect of taking care of an infant simulator also depends on the experiences of the girl, with a higher likelihood of a positive learning impact on girls who do not presently care for younger siblings or babysit. Therefore, it can be argued that the Virtual Baby may be more helpful to teenagers without previous baby-sitting experience. However, the school pupils seemed keen to impress and were aware of the simulator report feedback and as such may have experienced a Hawthorne effect creating a competitive attitude when receiving quantitative feedback.

This study also showed gender differences with regards to effect of the experience and perceptions towards pregnancy with females likely to answer that it was a deterrent compared to males. This finding suggests that the Virtual Baby may not be appropriate for boys than girls but the small number of boys in the study warrant further exploration on this gender difference. Interventions that aim to deter early pregnancy should equally involve and influence boys as they do for girls. There is strong support for the involvement of boys in health education and interventions as men play an equal role in parenting (Lachance et al, 2012).

This research strongly advocates the importance of School Nurses collaborating on sexual health education in schools with PSHCE, Psychology and Health and Social Care teachers using interactive digital technology like the virtual baby simulators. We feel that school teachers and nurses can enhance the learning of the importance of values of family life, marriage, and stable and loving relationships for the nurture of children and developing critical thinking as part of decision-making. Our findings revealed that the school pupils developed an appreciation of the consequences of choices made about sexuality, reproduction, sexual health, practical parenting and relationships.

This study disputes the findings of critics of the virtual baby program including Brinkman et al (2016) despite having a small sample size in one school. From this research, using virtual baby dolls at the school has grown in popularity and pupils have learned the reasons for delaying sexual activity, and the benefits to be gained from such delay along with lessons on the avoidance of unplanned pregnancy. As a result of this research the school is now actively involving health practitioners including school nurses more regularly in PSHCE lessons.

Conclusion

This study positively evaluated the use of the Virtual Baby in one UK school, as an educational tool in sexual health education and practical parenting. As Kirby (2001, p4) put it '*It is important to remember that each year a new set of teens arrives on the scene, meaning that efforts to prevent teen pregnancy must be constantly renewed*'. Additionally, Furstenberg (2003, p.36) states '*we do not have to convince teens that having children early in life is undesirable—most think so before they have sex; we only have to make it easier and more attractive to avoid this outcome*'. Therefore, the use of Virtual Baby program to educate teenagers about the difficulties and challenges parenting a baby while still at school are very important. This study revealed the increase in pupil meta-cognitive awareness of parenting, time and task demands of handling a baby, being a parent when still at school, understanding the need for contraception and secure relationships and an increased self-awareness of personal goals and future ambitions. This study advocates the role of the school nurse in sexual health education and deterring teenage pregnancy.

Future Research implications

This study has implications towards:

- ➢ Future research using the virtual baby dolls needs to address the long-term benefits of the VB program delivered by SNs and PSHCE teachers compared to pupils simply taking the VB doll home to parent over a weekend.
- ➢ Future research should report on gender uptake in teenage boys compared to girls and their views towards infant simulators as a practical parenting tool and deterrent to teenage pregnancy.
- ➢ Further UK based research using the VBs with SNs is required to produce policy change in and promotion of health professionals working more closely with school PSHCE lessons.
- ➢ Future research should consider a uniform approach to reporting outcomes in these types of virtual baby project trials to make for comparability across studies and geographical context.
- ➢ Future research could be conducted in low income countries to provide a balance of evidence on the obvious disparities in socio-cultural and economic situations.

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